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CLASSIFICATION OF THE BANANAS.

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I. The Genus *Ensete* Horan.

A plant of Abyssinia, described and figured by the traveller Bruce under its native name *Ensete*, was referred to the Linnean genus *Musa* by Gmelin in the 13th edition of *Systema Naturae* (1791). Gmelin used the word "*Ensete*" as the specific name, and his very brief diagnosis runs as follows :

Ensete. 3. *M. spadice* nutante, bracteis terminalibus.

Bruce trav. in Eg. Ar. Ab. and Nub. 5. *app. p.* 36 *icc.*

In 1862 Horaninow (*Prodromus Monographiae Scitaminearum*) considered that the plant in question was sufficiently distinct to represent a new genus, and accordingly raised the name *Ensete* to generic rank, renaming the species *Ensete edule*. The following is (with the exception of a footnote in which he discusses the term "*spadix*") a full transcription of Horaninow's descriptions, both generic and specific*; it should be noted that he erroneously attributes both the generic name and the binomial to Bruce, who in fact used "*Ensete*" merely as a vernacular name :

II. **ENSETE** Bruce Reise an die Quellen d. Nils V. p.47. t. 8-9 *Musa Ensete* Gmel. Syst. nat. 2. 567.

Flores abortu polygami, permulti. Hermaphrod. inferis hypanthium Musae triloculare multi-ovulatum. Perigonii labium majus lineare elongatum, apice trifidum, basi labellum breve ovatum emarginatum et longe-mucronatum amplexens. Stamina 5 labio majori sublongiora, sexto (parastemone ?) breviori, antheris linearibus, filamento aequilongis : stylus brevior, stigmatibus trilobis. Flores masc. superiores similes, hypanthio et stylo abortivis. Bacca oblongo-pyriformis, coronata; abortu 1-3-4-sperma : semina nucamentacea magna angulosa fusca, testa crassa, ad umbilicum excavata, albumine subfarinoso : embryo . . .

Ensete edule Bruce l.c. *Musa Ensete* Gmel. l.c. Hook. in Kew Gard. misc. 8, 210. *Enseté* Poir. in Dict. sc. nat. v. 14. p. 515. Bot. Mag. t. 5223-24. Op. nostri t. 4. Revue hortic. 1861. p. 124. Fl. d. serres

* I am much indebted to Dr. T. A. Sprague for obtaining and checking transcriptions, and for investigating on my behalf the validity of *Ensete* as a generic name.

XIV. p. 65. t. 1418.—Planta maxima 40-pedalis, in humidis Abyssiniae occidentalis vigens, perennis, Musam superbam et glaucam aemulans, caudice endogaeo discoideo non stolonifero, caulomate crasso conico, phyllopodiiis maximis crassis lacunosis subimbricatis obvallato, foliis 2-3- orgyalibus brevi-petiolatis lanceolatis utrinque acutis firmis, costa valida dorso fusco-purpurea : thyrsus (spadix) nutans brevistipitatus, bracteis (spathis) confertissimis pedalis ovatis acutis fusco-virentibus, floribus ebracteolatis 4-pollicar. albis : bacca molli fatua flavescens 2-3-poll., semina magnit. n. avellanae. Medulla scapi saporis triticini, decocta c. lacte et butyro, vescam incolis praebet.

Vidi vivam plantam in horto Kew. 1859 cultam et semina sicca exploravi, at characterem generis, a Musa floribus inferis hermaphrod., petalorum gemellorum defectu? staminodio magis exculto, fructu coronato et semine partim distincti, ad icon. et descriptiones cl. Bruce et Bot. Mag. exposui, observationibus novis rectificandum.

Since 1862 the genus *Musa* L. has been surveyed by Sagot (1887), J. G. Baker (1893), K. Schumann (1900), and De Wildeman (1912), and other botanists have written on it, but nobody has seen fit to maintain Horaninow's genus. Baker's arrangement of *Musa*, followed in its main features by Schumann in Engler's *Pflanzenreich*, remains the standard treatment of that genus down to the present day, and according to it *M. ensete* Gmel. and a number of other species form a subgenus *Physocaulis* Baker.

Genetical, cytological, and taxonomic studies of *Musa* in connexion with a banana breeding programme have convinced me of the desirability and propriety of reviving *Ensete* Horan. and transferring to it about twenty-five species hitherto included in *Musa* L. These comprise the whole of Baker's subgenus *Physocaulis*, two species that he classified in *Eumusa*, and a number that have been described since 1893 and referred to *Musa* § *Physocaulis* by their authors.

The desirability arises from the fact that *Musa* as hitherto recognized is an unwieldy genus, which becomes more compact and easy to study (though still difficult enough) when this group of species is removed from it. At the same time, the study of *Ensete* itself should be greatly facilitated by its segregation. It is an interesting genus in its own right, but has been neglected on account of the formidable implications of its association with *Musa*.

The propriety is to be judged from the number of respects in which the group differs from other sections of *Musa*. *Ensete* as I propose it is a genus of single-stemmed monocarpic herbs, with pseudostems dilated at the base ; *Musa sensu strictiore* is a genus of stooling perennial herbs with cylindrical pseudostems. The fruit of *Ensete* contains a relatively small number of large seeds, rarely less than 1 cm. in diameter, irregularly globose and smooth : that of *Musa* contains a larger number of small seeds, rarely attaining 1 cm. in diameter, very various in shape, often irregularly and sharply angular, rarely either globose or smooth, and if both, then very much smaller than those of any *Ensete* sp. and readily distinguishable. Both genera have wide ranges and they overlap, but *Ensete* has its greatest development in Africa, and many of its species grow in grassy or rocky places at altitudes where the climate is cool,

whilst *Musa sensu strictiore* has no indigenous species in Africa, and its commonest habitat is in rain-forest country. Finally, the genera appear to differ in chromosome number. The number of species so far examined cytologically in *Ensete* is only 7, but all of them have $n=9$, whereas a much larger number of species examined in *Musa* have either $n=10$ or $n=11$.

The cytological evidence is not advanced as the main reason for segregation of the genus *Ensete*, but it strongly supports the conclusion reached from other considerations. As it is partly scattered and partly unpublished it may for convenience be summarized here. The somatic chromosome number $2n=18$ has been found in the following :

- (1) Material obtained at Kew and said to be *Musa ensete*, though critical determination was not possible. Count by L. N. H. Larter in Cheesman and Larter, "Chromosome numbers in the Musaceæ", *J. Genet.* 30 : p. 46 and fig. 17 (1935).
- (2) *Musa superba* Roxb. Count by Agharkar and Bhaduri, "Variation of chromosome numbers in Musaceæ", *Curr. Sci.* 3 : 615-17 (1935).
- (3) Seedlings from seeds received at I.C.T.A. in December 1936 as *Musa davyae* Stapf. A covering letter from Kew stated that the seeds had been received from the Principal Botanist, Pretoria, and "the plant would seem to be a riverside species which has been recorded from the Spelonken and Zoutpansberg areas of the Transvaal". Count by K. S. Dodds in 1937, hitherto unpublished.
- (4) Seedlings from seeds received at I.C.T.A. in June 1939 from Kew, collected by Dr. G. Herklots near Chintembwe, Nyasaland, at about 5,000 ft. From the locality, and from the size and shape of the seeds, the species was probably *Musa buchanani* Baker. Count by K. S. Dodds, hitherto unpublished.
- (5) Seedlings from seeds collected by Dr. Herklots in 1939 in Nyasaland at 4,000 ft. Native name "Chisusu". These seeds were found to match those of *Musa livingstoniana* Kirk in the Kew Herbarium. Count by Dodds, hitherto unpublished.
- (6) Seedlings from seeds collected in Northern Nigeria by B. D. Burt. The seeds were indistinguishable from those of *Musa gillettii* De Wildem., described from the Congo, and may have been of that species or of another closely related. Count by Dodds, hitherto unpublished.
- (7) Seedlings from seeds collected in 1936 by G. B. Masefield at Kalinizo, Masaka District, Uganda. The species was not identified. Count by Dodds, hitherto unpublished.

The full data have been given, because in most cases the plants were not grown on to flowering and critically identified. The important fact is that the plants examined were certainly distinct, and not members of a single species under different names. This fact justifies the assumption that 9 pairs of chromosomes (a number not found in *Musa sensu strictiore*) are likely to be found in other species of *Ensete* when more are studied.

The apparent adaptation of many *Ensete* species to cooler and drier environments than those appropriate to most *Musa* species makes it very difficult, and in most cases impossible, to grow them much beyond the seedling stage in Trinidad ; and consequently we have been prevented

from studying them as living plants. For this reason, and because my main concern with the group is to remove it from *Musa*, I am reluctant to attempt any formal emendation of Horaninow's diagnosis. It is clear that several of his characters need modification to cover the whole range of species now transferred to *Ensete*. As one example, the hermaphrodite lower flowers of *E. edule* may not be general. Several species have been described from fruiting specimens, and it is impossible to learn from the literature whether the fruit-forming basal flowers were hermaphrodite or female. In any case, this is not a diagnostic character for *Ensete*, as hermaphrodite flowers occur in several species of *Musa*, section *Eumusa*. A character certainly needing emendation is "bacca . . . 1-3-4-sperma". But an accurate generic description can only be prepared when the genus has been properly studied, preferably on a living collection in some suitable district of Africa.

Informally the following general outline covers my conception of the genus *Ensete* as it should be emended :

Single-stemmed monocarpic herbs, usually large. True stem remaining short until flowering. Leaves large, the blades oblong, commonly narrowed below into a short or rather long free petiole, the latter again expanded below into a sheathing, but often not completely stem-encircling base. Sheaths of the lower leaves sometimes short, so that the plant has a rosette habit, sometimes long and forming a pseudostem like that of *Musa*. Pseudostem, when formed, nearly always dilated at the base. Upper leaves passing gradually or suddenly into bracts. Inflorescence pendulous. Bracts usually persistent. Flowers many to each bract, in two rows, those of the lower bracts hermaphrodite or female, those of the upper bracts male. Free tepal often tricuspidate, sometimes entire. Fruit leathery, dry or with very scanty pulp, containing relatively few seeds. Seed usually large (i.e. exceeding 1 cm. in diameter), globose or irregular, most commonly smooth, with a conspicuous, irregular and usually deeply sunken hilum.

Basic chromosome number, $n=9$.

Distribution : Mainly African, but extending to India, Burma, Southern China, Siam, Philippine Islands, Java and New Guinea.

With the reservation that field study may show some of them to be synonymous, the species clearly belonging to *Ensete*, arranged approximately in the order of their publication, are :

1. ***Ensete edule*** Horan. Prodr. Scitam. 41 (1862) ; *Musa ensete* J. F. Gmelin, Syst. Nat. ed. 13, vol. 2 (1791) 567 ; Baker in Ann. Bot. 7 : 205 (1893).

Note :—It seems very probable that the combination *M. ensete* has been applied to more than one species of the group in cultivation as ornamental plants. I have, therefore, not listed the numerous references which can be found in De Wildeman (1912), *Index Londinensis* and elsewhere ; each of them will need checking by the monographer of the genus.

2. ***Ensete superbum*** (Roxb.) comb. nov. ; *Musa superba* Roxburgh, Hort. Beng. 19 (1814), *nomen* ; Fl. Ind. vol. 2 (1824), 489, *descr.* ; *ibid.* ed. 2, vol. 1 (1832), 667 ; Baker *loc. cit.* 207.

3. **Ensete glaucum** (Roxb.) comb. nov. ; *Musa glauca* Roxburgh, Hort. Beng. 19 (1814), *nomen* ; Corom. Pl. t. 300 (1819) ; Fl. Ind. vol. 2 (1824), 490, *descr.* ; *ibid.* ed. 2 vol. 1 (1832), 669.

Notes : Baker placed *M. glauca* Roxb. in his subgenus *Eumusa* because it is described as having a cylindrical stem, but in all its more important characters it agrees with the other *Physocaulis* species, and Baker himself admits that it "has flowers like *M. superba*". Sagot (1887), who was the real author of the grouping formalized by Baker, placed it in its right group, but subsequent authors have followed Baker uncritically.

This species specially deserves study, because it has been recorded over a wider range than any of the others, viz. from Burma to the Philippine Islands and Java. Possibly several related forms have been confused.

The plant in the Philippines is depicted in *Philippine Agricultural Review* 6 (1913) facing p. 413 as "Virgen" banana, an unidentified wild species. Teodoro (1915) identifies it with *M. glauca* Roxb. and gives the synonym *Musa trogloditarum dolioliformis* Blanco, with a translation of Blanco's description from *Flora de Filipinas* (1877). Quisumbing (1919) has a note that the sap is coloured. The plant in Java is well described by Backer (1924).

Musa nepalensis Wallich, in Roxb. Fl. Ind. vol. 2 (1824), 492, provides a nice problem. Wallich described in great detail a plant from Nepal, of which he says : "I am doubtful if this plant ought to be considered as distinct from *M. superba*, or as an intermediate species between that and *M. glauca*, differing from the former in the sheathing petioles, and from the latter in its stature and inflorescence. I shall better be able to determine its character when the plants of it, which I brought down with me, and which thrive very well in the Hon. Comp. botanic garden, shall begin to blossom". Baker says of it : "Described principally from two large unpublished drawings of Wallich, now at Kew. Not known in cultivation". Kew Bulletin (1894, p. 243) adds an extract from a letter by Dr. King, dated Calcutta, 22nd August 1893 : "I do not believe in the existence of the species which Wallich called *M. nepalensis*. I have never been able to hear of, or find, any specimens of a big non-stoloniferous plantain on the lower slopes of the Himalaya. I have made enquiries in Nepal where Wallich says it grows. Wallich must have described Roxburgh's *M. glauca* under the name *nepalensis*". If *M. nepalensis* does exist, it belongs to *Ensete* ; but it does not seem immediately desirable to cumber the literature with a new combination to name so doubtful an entity.

4. **Ensete ventricosum** (Welw.) comb. nov. ; *Musa ventricosa* Welwitsch, Apont. 545 and 587, No. 45 (1859) ; Baker *loc. cit.* 206.

5. **Ensete livingstonianum** (Kirk) comb. nov. ; *Musa livingstoniana* Kirk, in Journ. Linn. Soc. 9 (1867), 128 ; Baker *loc. cit.* 207.

Note : The seeds of this species are described as "tubercled" ; but I have examined what appears to be authenticated material at Kew and the "tubercles" are very obscure, certainly not prominent enough to conflict with the generic description of *Ensete* seeds as "smooth".

6. **Ensete calospermum** (*F. v. Muell.*) comb. nov. ; *Musa calosperma* F. v. Muell. in Proc. Linn. Soc. N. S. Wales **10** (1885), 355, et in Gard. Chron. ser. 3, vol. **20** (1896), 360.

Notes : The *Gardeners' Chronicle* note cited is supplemented (*ibid.* p. 467) by a drawing (fig. 85) which by printer's error is titled "Inflorescence of *Musa alosperma*". The error is worth notice because the combination "*Musa alosperma*" has found its way into *Index Londinensis*.

Baron von Mueller's very interesting species from New Guinea was overlooked by Baker, and so far as I can determine by Schumann, and De Wildeman only lists it, but it seems to be as true an *Ensete* as any African representative.

In connexion with the occurrence of this species in the Pacific, attention may be drawn to a note by H. B. Guppy in "*Observations of a Naturalist in the Pacific*" (p. 436) as follows : "The occurrence in Fijian beach-drift of the seeds of *Musa Ensete*, or of a wild banana much like it, is very remarkable The empty seeds are frequent on the beach at Duniua at the mouth of the Ndreke-ni-wai in Savu-savu Bay, Vanua Levu, and are doubtless brought down by that river They answer to the description and the figure given by Schumann for *Musa Ensete* ; and their presence in the drift is one of the mysteries of the Pacific Floras". From this it appears possible that either *E. calospermum* is fairly widespread in the Pacific, or it has close relations in that region.

7. **Ensete proboscideum** (*Oliver*) comb. nov. ; *Musa proboscidea* Oliver in Hook. Icon. Pl. **18**, t. 1777 (1888) ; Baker *loc. cit.* 207.

8. **Ensete lasiocarpum** (*Franchet*) comb. nov. ; *Musa lasiocarpa* Franchet in Morot, Journ. de Bot. **3** (1889), 329 ; Baker *loc. cit.* 208.

Note : This extremely interesting species needs much further study. Baker referred it to *Eumusa*, presumably because it is described as having a rhizome, for it has scarcely any other character of *Eumusa*. Franchet wrote in his notes with the original description : "Sa végétation souterraine, autant qu'on peut juger par les spécimens envoyés à l'herbier du Muséum, consiste en un gros rhizome de 0 m. 05 à 0 m. 07 de diamètre qui paraît se développer horizontalement, sans qu'on puisse dire encore si la plante est monocarpieenne et si elle reproduit, ou non, par rejet".

I have examined herbarium material at Kew which must be the original collection by Delavay. The flowers appear to be borne on a fleshy cone unique among *Musaceae*, but morphologically this is only the axis of the inflorescence unusually developed. Franchet proposed for this species a new section of *Musa*, to be called *Musella*, and it may on further study be found to represent a distinct genus ; but I should not be prepared to separate it, on the existing material alone, from *Ensete*, with which it has close affinity. Whatever it may be, it is certainly not a *Musa*, *sensu strictiore*.

9. **Ensete buchanani** (*Baker*) comb. nov. ; *Musa buchanani* Baker in Ann. Bot. **7** (1893), 207.

10. **Ensete elephantorum** (*K. Schum. et Warb.*) comb. nov. ; *Musa elephantorum* K. Schumann et Warburg ex K. Schum. in Engler, Pflanzenreich **4**, 45 (*Musac.*), 14 (1900).

11. **Ensete schweinfurthii** (*K. Schum. et Warb.*) comb. nov. ; *Musa schweinfurthii* K. Schum et Warb. ex K. Schum. in Engl. Pflanzenreich **4**, 45 (Musac.), 14 (1900).

Note : Synonyms of this, according to Hutchinson and Dalziel in *Flora of West Tropical Africa*, Vol. **2**, Part 2 (1936), p. 328, are *Musa chevalieri* Gagnepain in Bull. Soc. Bot. France 55 Mem. 8 (1908), p. 87 ; *M. martretiana* A. Chevalier in Bull. Soc. Acclim. Paris (1907), p. 79, *nomen*, et in Rev. Bot. Appl. **14** (1934), 507 ; and *M. riperti* A. Chevalier, Expl. Bot. Afr. Occ. Franç. (1920) **1**, 632, *nomen*. *Musa martreti* A. Chev. ex Tribune Hort. **3** (1908), 38, (reference not seen by me) is apparently *nomen nudum* and probably written in error for *M. martretiana*.

12. **Ensete religiosum** (*Dybowski*) comb. nov. ; *Musa religiosa* Dybowski in Rev. Hort. **72** (1900), 262 ; De Wildeman, Ann. Mus. Col. Marseille ser. 2, **10**, 352 (1912) ; *Musa dybowskii* De Wildeman (err. cal.) *ibid.* **7**, 245 (1909).

13. **Ensete arnoldianum** (*De Wild.*) comb. nov. ; *Musa arnoldiana* De Wildeman in Bull. Soc. Etud. Colon. Brux. **8** (1901), 339.

Note : *Musa hybrida* Gillet in L'Agronomie tropicale (1909), 29, appears to have been a hybrid between *E. arnoldianum* and *E. gillettii*. I have not seen the original description, but take the information from De Wildeman, who did not know how the hybrid was obtained. The plant is of some interest as the only recorded hybrid in the genus *Ensete*, but in view of the scanty information about it I have not thought a new combination necessary for it under that genus.

14. **Ensete gillettii** (*De Wild.*) comb. nov. ; *Musa gillettii* De Wildeman in Rev. Cult. Colon. **8** (1901), 102.

15. **Ensete wilsoni** (*Tutcher*) comb. nov. ; *Musa wilsoni* Tutcher in Gard. Chron. ser. 3, **32** (1902), 450.

16. **Ensete holstii** (*K. Schum.*) comb. nov. ; *Musa holstii* K. Schumann in Engl. Jahrb. **34** (1904), 121.

17. **Ensete ulugurense** (*Warb. et Moritz*) comb. nov. ; *Musa ulugurensis* Warburg et Moritz ex O. Warburg in Tropenflanzer **8** (1904), 116.

18. **Ensete perrieri** (*Claverie*) comb. nov. ; *Musa perrieri* P. Claverie in Comptes Rendus Acad. Sci. Paris **140** (1905), 1612, *nomen*, et in Ann. Mus. Colon. Marseille ser. 2, vol. **7** (1909), p. 74, descr. cum ic. t. 8.

19. **Ensete fecundum** (*Stapf*) comb. nov. ; *Musa fecunda* Stapf in Journ. Linn. Soc. (Bot.) **37** (1906), 526.

20. **Ensete laurentii** (*De Wild.*) comb. nov. ; *Musa laurentii* De Wildeman Miss. E. Laurent, **1**, 371 (1907).

21. **Ensete bagshawei** (*Rendle et Greaves*) comb. nov. ; *Musa bagshawei* Rendle et Greaves in Journ. Bot. **48** (1910), 169, et t. 506.

22. **Ensete homblei** (*Bequaert*) comb. nov. ; *Musa homblei* Bequaert ex De Wildeman in Ann. Mus. Colon. Marseille ser. 2, vol. **10** (1912), p. 332.

Note : This species is exceptional in the size of its seeds, which are the

smallest I have seen in the genus, only 6–8 mm. in diameter. In shape and structure, however, they conform to the general *Ensete* pattern, and from De Wildeman's description there can be no doubt about the affinities of the species.

23. ***Ensete davyae*** (Stapf) comb. nov. ; *Musa davyae* Stapf in Kew Bull. (1913), p. 102.

24. ***Ensete ruandense*** (De Wild.) comb. nov. ; *Musa ruandensis* De Wildeman in Bull. Jard. Bot. Brux. **8** (1923), 111.

25. ***Ensete rubronervatum*** (De Wild.) comb. nov. ; *Musa rubronervata* De Wildeman in Bull. Jard. Bot. Brux. **8** (1923), 112.

UNDETERMINED SPECIES OF THIS AFFINITY.

Two collections from Siam represent one or two undetermined and probably undescribed species clearly of this genus, viz. :

Put 426, Doi Chiangdao, 21 October 1926, affinities apparently with *E. glaucum*, but seeds smaller and more numerous.

Kerr 6271, Mè Chêm, Chiangmai, c. 500 m., 10 July 1922. "Klue Pam Pa". Described *inter alia* in the collector's notes as having dull red bracts and abundant red juice.

These specimens were examined at Kew in 1938 by the courtesy of Dr. A. F. G. Kerr, and should prove of great interest and importance to the student of *Ensete*.

SPECIES AT PRESENT OF DOUBTFUL AFFINITY.

1. *Musa gigantea* Kuntze, Rev. Gen. 691 (1891). Placed by Schumann in the subgenus *Physocaulis* "not without hesitation". The plant described was in a Java garden, and said to be from Sumatra. The habit suggests an *Ensete* sp. but the description of the fruit suggests that the plant was partially sterile, or else had received no pollen (which it would not if the lower flowers were female only and the plant was growing alone). The 8–10 small (1–3 mm.) and pale seeds in a 3–4-angled, scarcely fleshy, fruit strongly suggest failure of fertilization. This must remain "*species dubia*" until more is known about the fruit and seed. Backer does not mention it in his excellent account of *Musaceae* in *Flora van Java*.

2. *Musa imperialis* Hort. Vilmorin. ; Pucci in Bollet. Soc. Tosc. Ort., p. 299 (1906), appears to be a trade name for a species put into commerce, probably as a foliage plant. Original not seen. De Wildeman (1912) lists it as a species of Baker's subgenus *Physocaulis*.

NOTE ON DISTRIBUTION.

Nineteen of the species listed are described from continental Africa and one (*E. perrieri*) from Madagascar, leaving five described extra-African species and one undescribed, the occurrence of the last suggesting that there may well be others yet to be discovered in S.E. Asia. The extra-African species are *E. superbum* recorded in several parts of India, *E. glaucum* ranging from Burma to the Philippines and Java, *E. lasio-*

carpum and *E. wilsoni* from Southern China, and *E. calospermum* from New Guinea. With Kerr 6271 in Siam the distribution is almost continuous from Southern India to New Guinea, but no species have been recorded from Ceylon, the Malay Peninsula, or Queensland. The whole distribution is very interesting, whether considered by itself or in relation to that of *Musa*, which covers much the same range but extends into Ceylon, Malaya and Queensland, and further eastward into the Pacific than *Ensete* has yet been found.

RELATIONSHIP WITH *Musa*.

Speculations about phylogeny are always tempting but not invariably profitable. In *Musaceae* the established facts scarcely justify even cautious theory, but a few remarks are offered as a provocation to further enquiry and discussion.

It would be unsafe to regard *Musa* as "derived from" *Ensete*, and almost impossible to imagine the reverse; yet the two genera (as indicated by their long accepted association in one) are sufficiently close to allow us to postulate a common ancestral stock at no very remote geological time, and of the two I regard *Ensete* as probably retaining more of the primitive characters of that stock than *Musa*.

Characters which may reasonably be postulated for the primitive stock include large size; stoloniferous habit; leaf-bases sheathing but not completely encircling the stem; gradual transition from foliage leaves to bracts; persistence of bracts after flowering; hermaphrodite flowers—at least under the basal bracts, though some differentiation of sex may well go still further back in time, giving staminate flowers only in the axils of the upper bracts; large seeds relatively few in number.

From a hypothetical stock with those characters, two lines of descent may have diverged. The prime cause of divergence would be in all probability the attainment of a new chromosome balance, though the point of divergence would not necessarily be the point at which the chromosome numbers of the modern genera were established.

Along one line, which survives in *Ensete*, the most striking development was that of the monocarpic habit. In some of the other characters the modern genus shows considerable variation. Some species have retained a large size and some have become much smaller, but the smaller ones retain robust proportions associated with a relatively broad apical meristem, and this may be correlated with the imperfect sheathing of the leaf-bases, which does not afford the mechanical strength necessary for the formation of a slender pseudostem. Some species have developed more than others toward an abrupt change from green foliage leaves to coloured, or otherwise conspicuously different, floral bracts; none, that I know of, has developed the habit of cutting off and dropping its bracts within a few hours of anthesis, as most *Musa* species do. How many have developed purely female basal flowers is not clear, but hermaphrodite flowers are apparently still common. All have retained an essentially similar seed shape, and most a large seed size; there are one or two species in which the seeds are smaller than the largest in *Musa*, but these are exceptional.

Along the other line of descent there were more changes. The stoloniferous habit was retained, but the leaf-bases became stem-encircling, and where reduction in plant size took place it was frequently associated with a slenderer habit. Most of the species developed deciduous bracts, quite sharply distinguished from the foliage leaves in form and colour. There was a general tendency towards reduction in the size of the seeds, accompanied by an increase in their number and the development of a rather more fleshy fruit. This line survives in *Musa*, a genus of much greater diversity in all its morphological characters than *Ensete*, yet more restricted in its ecological range.

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CLASSIFICATION OF THE BANANAS.

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II. The Genus *Musa* L.

The standard classification of the genus *Musa* L. in use at present is primarily due to Sagot (1887), who first suggested "for the rational grouping of the species" a division into three sections: (1) Giant bananas of the type of *M. ensete*; (2) Bananas with fleshy fruit, often edible, type *M. sapientum*; (3) Ornamental bananas with upright inflorescences and brightly coloured bracts.

J. G. Baker (1893) treated the genus more formally, but adopted Sagot's division almost unaltered by defining three subgenera as follows:

Subgenus *Physocaulis*. Stem bottle-shaped. Flowers many to a bract. Petal usually tricuspidate. Fruit not edible.

Subgenus *Eumusa*. Stem cylindrical. Flowers many to a bract. Petal ovate-acuminate. Bracts green, brown or dull violet. Fruit usually edible.

Subgenus *Rhodochlamys*. Stem cylindrical. Flowers few to a bract. Petal linear. Fruit usually not edible. Bracts bright-coloured, often red.

Since 1893, at least fifty new specific names have been added under *Musa*, and although a few of them are not valid the group is about twice as large as it was then. In the last twenty years or so genetical and cytological studies have also been prosecuted, which have provided an entirely different standpoint from which to view the classification of the genus—especially with regard to the relationship of the cultivated forms to the wild. A complete revision is overdue : but the difficulties in the way of assembling all the necessary material are formidable, and the best that can be done at present is to outline the plan that the revision should follow.

I have, in the preceding paper (page 97), proposed the transfer of a group of species, including the whole of Baker's subgenus *Physocaulis*, to Horaninow's neglected genus *Ensete*. The present paper suggests a re-grouping of the species remaining within the restricted genus *Musa*, to conform with the findings of cytological and genetical studies of material in the I.C.T.A. *Musa* collection.

In the re-grouping the edibility or inedibility of the fruit is ignored. We now know that "edibility" in the bananas and plantains depends primarily on the occurrence of parthenocarpy—the development of the fruit without pollination of the female flower—with which is always coupled more or less female sterility causing a tendency for the fruit to be seedless (cf. Dodds, 1943). We can find no evidence that parthenocarpy has ever occurred in more than a very few of the many species of *Musa*. Consequently the very numerous parthenocarpic forms in cultivation, though important economically, are taxonomically insignificant ; and undue emphasis on them is a weakness in Baker's treatment. The classification of the cultivated varieties is almost a separate problem from the general taxonomy of the genus, needing a different technique for its solution, and confusion of the two makes both almost impossible.

One division in the new classification has a cytological basis and falls between species having 11 pairs of chromosomes and species having 10 pairs. The difference involves fundamental differences in genetical behaviour and, as far as our experience goes, chromosome number is in *Musa* not only a safe criterion of relationship but the best. It is correlated with many small differences in habit and physiology which collectively make the division easily recognizable in the field—with experience. But many of those differences are easier to recognize than to describe, and simple key characters are very difficult to find in *Musa*. In cases of doubtful classification, therefore, chromosome number must be the deciding factor.

The 11-chromosome species appear to be a relatively close assemblage, but may be divided for convenience on characters similar to those used by Baker into a group having generally many-flowered dull-coloured bracts and a group having generally few-flowered bright-coloured bracts. These groups may also retain Baker's names.

The 10-chromosome species fall much more definitely into two groups. Again one group has usually dull-coloured and the other bright-coloured bracts, but the much more important distinction is that whilst one group retains a seed like that of 11-chromosome species the other has developed a distinctive seed shape which is one of the few simple but reliable diagnostic characters in the genus.

A general description of the genus is now given and the suggested division into sections follows this.

MUSA L.

Perennial stooling herbs. True stem remaining short until flowering. Leaves large, blades oblong, petioles long and expanded below into long, sheathing and stem-encircling leaf-bases forming a pseudostem. Inflorescence pendulous, half-pendulous, or erect. Bracts plane or sulcate, convolute or more or less imbricate in the bud, usually deciduous. Flowers in a single row or in two rows to each bract, those of the lower bracts female or hermaphrodite, those of the upper bracts male, sometimes (i.e. in the cultivated or semi-domesticated forms) all functionally sterile. Perianth (according to the usual interpretation) of two parts: a compound tepal (calyx) essentially tubular, but split to the base on the adaxial side, 5-toothed at the apex, or perhaps better described as 3-lobed at the apex with 2 accessory teeth between the main lobes; and a free tepal (petal or corolla) inserted within the compound tepal and opposite to it (i.e. in the adaxial position). Stamens 5. Ovary inferior, trilocular. Fruit fleshy, with numerous seeds (except in the parthenocarpic forms). Seeds irregularly globose, lenticular, or cylindrical, with a perisperm chamber above the endosperm.

A. Chromosome number $x=11$. Bracts usually more or less sulcate, often more or less glaucous, rarely or never polished, convolute or more or less imbricate in the bud, usually strongly revolute on fading. Seeds occasionally subglobose, more often dorsiventrally compressed, sometimes lenticular, smooth, tuberculate, or irregularly angulate, with a marked or obsolete umbo opposite to the hilum.

1. Inflorescence pendent or semi-pendent from the first, the fruits reflexing in development towards the base of the rachis. Flowers many to a bract, in two series. Bracts commonly dull-coloured, green, brownish or dull purple. Pseudostems commonly exceeding 3 metres high Section **EUMUSA**
2. Inflorescence erect, at least at the base, so that the fruits do not reflex in development but point towards the apex of the rachis. Flowers few to a bract, usually in a single series. Bracts brightly coloured, often red. Pseudostems commonly less than three metres high Section **RHODOCHLAMYS**

B. Chromosome number $x=10$. Bracts plane, firm in texture, polished on the outside, rarely or never glaucous, strongly imbricate in the bud, not or only slightly revolute on fading.

3. Seeds sub-globose or more or less dorsiventrally compressed, smooth, striate, tuberculate, or irregularly angulate, with a marked or obsolete umbo opposite to the hilum corresponding to a small perisperm chamber within
Section **AUSTRALIMUSA**
4. Seeds cylindrical, barrel-shaped, or top-shaped, marked externally by a transverse line or groove, above which they are warted, tuberculate or variously patterned, below usually smooth; internally with a well-developed perisperm chamber above the same line, this chamber empty in the ripe seed

Section **CALLIMUSA**

Section *Eumusa* Baker may be called the group of the true bananas. It contains the two commonest and most widely ranging species in the genus, *M. acuminata* Colla and *M. balbisiana* Colla, and with them all the cultivated forms that we believe to have been derived from them. These cultivated forms appear, on the evidence at present available, to include all the bananas and plantains originating in India or Malaysia; which for practical purposes means nearly all the bananas and plantains of the world. They certainly include all the important varieties commonly found in cultivation. Among them *M. paradisiaca* L., as the entity first named in the genus by Linnaeus, may be regarded as the "type species", although a seedless cultivated form.

Of the 14 species referred to this section by Baker, four are edible forms correctly classified but not valid species; one (*M. discolor* Horan.) is a dubious entity; two (*M. lasiocarpa* Franchet and *M. glauca* Roxb.) belong to *Ensete* Horan.; two (*M. textilis* Née and *M. fehi* Bert. ex Vieill.) certainly belong to the new section *Australimusa*; two more (*M. hillii* F. v. M. and *M. fitzalanii* F. v. M.) very probably belong to *Australimusa* likewise, but are not very well known and cannot be referred with complete confidence. These transfers and reductions leave only *M. acuminata* Colla, *M. banksii* F. v. M. and *M. basjoo* Siebold, to which I add *M. balbisiana* Colla included by Baker in *M. sapientum* L.

Of species added since 1893 I refer here *M. nagesium* Prain, though it is a peculiar type which may later prove to represent a subsection. We have in the I.C.T.A. collection one undescribed species from Burma which is certainly a *Eumusa*. Thus, excluding cultivated forms, the section as I now recognize it contains at least six valid and distinct species, of all of which we have living material.

On complete revision a large number of binomials will have to be considered, many of which are doubtless synonyms of one or other of our six species. A few probably represent distinct entities but cannot at present be classified on account of incomplete descriptions. Several herbaria contain unidentified material clearly referable to this section, but there is no advantage to be gained in *Musa* from basing new species on dried specimens. These collections are chiefly useful as indications of localities in which living material should be collected for study. They also serve to warn us that our knowledge of the genus is still only fragmentary.

The six well known species are all tall plants, flowering at 3-5 metres or more. Three of them are as robust in proportions as many cultivated bananas, though their fruits are smaller. The other three are slenderer, but still so banana-like that no further description of their habit is necessary.

The two common species have a wide distribution. *M. balbisiana* occurs in Ceylon, India, Burma, Siam, Malaya, Java, and the Philippines to New Guinea, with little apparent variation throughout its range. *M. acuminata*, as I understand it, occurs in Assam, Burma, Siam, Indo-China, the Malay Peninsula and Archipelago, and the Philippines, with very great variation from district to district and even within countries. The others are more localized: *M. banksii* is known from Queensland, New

Guinea and Samoa ; *M. basjoo* comes from the Liukiu Archipelago but is chiefly known from cultivated specimens in botanical gardens ; *M. nagensium* occurs in Assam and Burma, with a related form in Sikkim ; our undescribed species is so far known only from one locality in Burma. The general conclusion to be drawn from the known distribution is that the most probable centre is the region of Burma-Siam-Indo-China, which region as well as the Malay Archipelago probably contains several undescribed species.

Section *Rhodochlamys* Baker has its oldest and best known representative in *M. ornata* Roxb. It contains, so far as known, no species having parthenocarpic forms, and no edible bananas are referable to it. Baker erred seriously in referring to *Rhodochlamys* the plant described by Jacquin as *Musa maculata*, which is an edible banana quite definitely belonging to *Eumusa* and not a valid species at all. His description of *M. sumatrana* Becc. is puzzling, and I suspect that Beccari's plant is referable to *Eumusa*, though Baker's description may include a *Rhodochlamys* species.

Of Baker's nine other species, *M. coccinea* Andr. and *M. salaccensis* Zoll. are now transferred to the new section *Callimusa* and seven remain, namely, *M. ornata* Roxb. (misnamed by Baker *M. rosacea* Jacq.), *M. mannii* Wendl., *M. velutina* Wendl. & Drude, *M. sanguinea* Hook. f., *M. rosea* Baker, *M. rubra* Wallich ex Kurz, *M. aurantiaca* Mann.

Of species described since 1893 and referred to *Rhodochlamys* by their authors I accept none, but refer most of them confidently and the rest tentatively to *Callimusa*. We have, however, in the I.C.T.A. collection one undescribed species from Burma to add, making at least eight in the section, of which we have living material of four.

All are relatively small plants, flowering at 1-2 metres or even at less than a metre high. With this small stature they are correspondingly slender and (so far as the habit has been described) stool freely, forming clumps. The section is defined by the small size, erect inflorescence, and few flowers to a bract, and none of these seems a fundamental character. The petal character included by Baker is variable, five species having the free tepal nearly as long as the compound tepal, and three having it much shorter and more of the shape found in *Eumusa*. It is not possible at present to say whether this feature is correlated with differences in genetical behaviour or not.

The known distribution of the section is Chittagong, Assam, Burma and Siam, with four of the species known only from Assam and none of them apparently widespread. It may extend to Indo-China, and does so if my tentative reference of *M. angcorensis* Gagnep. and *M. splendida* A. Chev. to *Callimusa* is wrong ; but it is fairly certainly narrower than that of *Eumusa*.

Section *Australimusa* (*Musae* bracteis valde imbricatis nitentibus, seminibus irregulariter subglobosis vel dorsiventraliter depressis angulosis) is typified by *M. textilis* Née. Until quite recently I regarded this species as anomalous, because it has the chromosome number and the polished bracts of *Callimusa* with a seed like that of *Eumusa*. An observation by K. S. Dodds (1946) on *M. fehi* Bert. ex Vieill. and chromosome counts by him of several recent accessions in the I.C.T.A. collection

brought us to realize that the same combination of characters is shared by a group of species hitherto confused with *Eumusa* but manifestly distinct genetically.

The occurrence of parthenocarpy in *M. fehi* (under which name there may be more than one species confused) has helped to obscure the position, as it has been natural in the past to regard all forms of *Musa* with edible fruits as fairly closely related. It is now clear that the "fehis" of the Pacific are distinct from the true bananas originating further west and common in cultivation throughout the tropics. Incidentally, the fehis though edible are scarcely cultivated. The relationships of the apparently indigenous bananas of Hawaii described by Pope (1926) remain obscure; and until they are determined, no statement can be safely made about the incidence of parthenocarpy in *Australimusa* as a whole, because some of the Hawaiian forms may conceivably be referable here. But in any event the development of parthenocarpy in this section as well as in *Eumusa* looks like a case of parallel evolution.

The section contains at least five and possibly eight or more distinct species. We have three in the I.C.T.A. collection, in addition to *M. textilis*. One was received from New Guinea as *M. peekelii* Lauterbach and is probably that species; the other two await description, and one of them, from Halmaheira, is certainly new. Since recognizing the existence of this section, I have little doubt that *M. hillii* F. v. Muell. and *M. fitzalani* F. v. Muell. will prove to belong to it when better known; as also the imperfectly described *M. maclayi* F. v. Muell. from New Guinea, which may possibly be conspecific with one of our undescribed species.

All the species seen have rather bright green pseudostems, and a habit from which they can be recognized as distinct from other *Musa* spp. even in the vegetative state, though it is not easy to define the causes of the distinctness. One contributory factor is an absence of wax bloom from the upper parts of the leaf-sheaths, which allows the green colour full expression. Another is the tough fibrous nature of the leaf-sheaths (commercially important in *M. textilis* but shared by the others) by virtue of which the older and dead sheaths peel away cleanly, exposing the green pseudostem beneath, in contrast to *Eumusa* where the dead sheaths usually persist in a tattered condition and conceal the colour of the lower part of the pseudostem. A third factor in appearance is that in actively growing shoots each leaf-sheath is further exerted beyond the next older one than in most *Eumusa* spp. The sum of these characters is a very distinct facies.

The inflorescence may be pendent, semi-pendent, or erect; and within this group its attitude does not appear to be connected with any fundamental genetic differences, though on this point we have little information. The flowers may be fairly numerous or relatively few (7 or 8) per bract, and in our *M. peekelii* some "hands" of the fruit bunch are biseriate and some uniseriate.

M. textilis is a native of the Philippine Islands; *M. fehi* is recorded from Tahiti, New Caledonia and Fiji; our *M. peekelii* and one undescribed species are from New Guinea, like *M. maclayi*; *M. hillii* and *M. fitzalani* were described from Queensland; our latest accession in the group is from Halmaheira, N.E.I. Thus the section is mainly

Australasian, and the fact seemed worth signaling in its name. At present only one certain species of *Eumusa* is known east of New Guinea (viz. *M. banksii*, ranging to Samoa) and the distributions of the two sections look very different. There are a number of imperfectly known species both in the Malay Archipelago and in the Western Pacific, and further study is needed to demonstrate the limits and extent of overlap of the sections.

Section *Callimusa* (Musae bracteis valde imbricatis nitentibus, seminibus turbinatis, dolioliformis vel cylindraceutis) has its best known and oldest representative in *Musa coccinea* Andrews, and is named partly from the fact that that species is the most ornamental in the genus and partly in recognition of the beautifully coloured bracts of other members.

Of species known to Baker, two can be referred here with confidence, namely *M. coccinea* itself and *M. salaccensis* Zollinger, the seed of which is well described by Backer in *Flora van Java*. Of species described since 1893, *M. borneensis* Beccari, *M. violascens* Ridley, *M. campestris* Becc. and *M. hirta* Becc. can be referred from their descriptions. In the I.C.T.A. collection we have an undescribed species from Malaya, received as *M. violascens* but not agreeing with the description of that plant. The section therefore contains at least seven good species, of which we have material of three.

Here, as in *Australimusa*, the inflorescence may be either erect or pendulous, and when it is erect the plants simulate *Rhodochlamys* sufficiently to be referred there by collectors unaware of the existence of two distinct series of bright-bracted Musae. Consequently there are several species described under *Rhodochlamys* which we cannot definitely place because the essential features have been omitted from the description. I can only tentatively refer here *M. angcorensis* Gagnep. with bracts described as *glaberrimae*, and *M. splendida* A. Chev. of which the bracts are "fortement imbriquées"; the diagnostic seed character is not described for either.

Like *Rhodochlamys*, *Callimusa* has no known parthenocarpic member or economic species. Its known members vary widely in size and habit. *M. borneensis* is similar in appearance and size to a common banana, and has fruits up to 16 cm. long in a pendent bunch. *M. coccinea* flowers at a metre high or less, and on account of its small size is popular in conservatories in temperate countries: its inflorescence is erect, very short and compact, and with its narrow bracts and very "open" bud (several bracts exposing their flowers simultaneously) it is very un-banana-like in appearance. The other species are intermediate between these extremes. They vary much also in number of flowers per bract, both biseriate and uniseriate flowers occurring; and *M. coccinea* with 2-3 flowers only in each axil is the extreme case of reduction in this respect. Some of the species have a conspicuous corrugated auricle at the base of the petiole, not noted elsewhere in the genus: others are described as having the leaf-blade decurrent on the petiole. The three studied on living material resemble members of *Australimusa* in the firm texture of their bracts and leaf-sheaths.

M. coccinea was described from China and has been recorded as abundant in Indo-China; *M. salaccensis* is known from Java and Sumatra;

M. violascens and our undescribed species are from the Malay Peninsula ; Beccari's three species are all described from Borneo. The distribution indicated by these seven species is fairly distinct from that of *Rhodochlamys* and has its probable centre a good bit to the south-east. The identification of *M. angcorensis* and *M. splendida* is important in defining the distribution of *Rhodochlamys* as they both occur in Indo-China. But in any case *Callimusa* and *Rhodochlamys* certainly overlap in Siam, for I have seen unidentified herbarium specimens of both affinities from that country.

It seems worth mentioning here that the *Rhodochlamys* species occurring in Siam (represented by *Kerr* 6143 and *Kerr* 4561 in Dr. A. F. G. Kerr's collection) must have a strong superficial resemblance in the field to *M. coccinea* Andr., as it has an erect inflorescence and similar red bracts similarly arranged in the terminal bud. Only the seed is entirely different. This may be *M. rubra* Wall. ex Kurz, which was described from Burma and said by Baker to have the habit of *M. coccinea*, but to differ by its short petal. Not being familiar with *M. rubra*, I hesitate to make the identification, but the pair of species seems to afford a very interesting example of parallel evolution, and illustrates the necessity for examining the seed (or the chromosome number) before definitely referring a species to its position in *Rhodochlamys* or *Callimusa*.

The *Callimusa* species occurring in Siam is represented by *Kerr* 7431 and *Kerr* 7431 A, Betong, Pattani (1923). The inflorescence is of the slender erect type with the flowers in a single series in each bract ; mature fruits are 10 cm. long, 1.5 cm. in diameter in the dry state ; the seeds are pyriform, of typical *Callimusa* structure. The plant has evident affinities with *M. salaccensis* Zoll.

RELATIONSHIP OF THE SECTIONS

The groups have deliberately been called sections rather than subgenera in an attempt to avoid the implication that they are of equal rank. I am inclined to regard the division between *Eumusa* and *Rhodochlamys* as unessential, though it is convenient to maintain as long as it remains as well marked in the field as it is at present. On the other hand the seed of *Callimusa* almost justifies its segregation as a distinct genus, and would do so were not *Australimusa* intermediate in some characters between it and *Eumusa*.

Light on relationships, both within and between the sections, is most likely to be obtained from cytogenetical studies of species crosses. Five species of *Eumusa*, four of *Rhodochlamys*, one (*M. textilis*) of *Australimusa* and three of *Callimusa* have been experimentally crossed in various combinations and numerous species hybrids have been raised, but the big task of analysing their behaviour will take years to complete and few generalizations can yet be made. Those given here are tentative.

As might be expected, 11-chromosome species and 10-chromosome species do not cross readily. In fact whenever the 10-chromosome species has been used as female parent numerous pollinations have failed to set fruit at all ; several hybrids have been obtained when *Eumusa* species were the female parents but few of them are vigorous. Crosses between species of the same chromosome number are usually effected readily, but not always ; and there are differences in behaviour in this respect,

not only between species but between varieties. *M. balbisiana* combines with almost anything, which is very interesting in view of its wide range, well-defined nature as a species, and relatively narrow variation.

One of the most interesting tentative findings, though it needs much more testing for confirmation, is that *Callimusa* species do not cross more readily with *Rhodochlamys* than with *Eumusa*, but possibly the reverse. Only one hybrid *Rhodochlamys* ♀ x *Callimusa* ♂ has yet been raised, but not all the possible combinations have been properly tested. The interest lies in the evidence that may be obtained for or against the view that *Rhodochlamys* and *Callimusa* have evolved from *Eumusa* and *Australimusa* respectively along independent but partly parallel lines.

On other grounds, and especially that of distribution, it seems reasonable to postulate that 11-chromosome and 10-chromosome lines diverged relatively long ago and that *Rhodochlamys* is a relatively recent offshoot of the *Eumusa* line of descent. Neither distribution nor other considerations suggest that *Callimusa* is equally recent. It is in respect of plant size, habit, and flower-number the most heterogeneous of the sections, as *Rhodochlamys* is the most homogeneous: and its differentiation from the ancestral stock of *Musa* may have been independent of that of *Australimusa* and possibly earlier.

These speculations are advanced in the hope that they may stimulate investigation of a genus that is difficult to collect and to study, but sufficiently interesting and important in both its economic and its more strictly botanical aspects to repay the investigator.

The notes to be presented concerning individual species are in many respects incomplete, and their compiler feels that they should be prefaced by a few remarks in explanation.

The genus *Musa* presents peculiar difficulties to the student, and although of great economic importance (containing as it does two series of crop plants, the bananas and the Manila hemps) it remains very imperfectly known and classified. In the first place its geographical distribution is wide, ranging approximately in longitude from 75°E to 150°W and in latitude from 30°N to the Tropic of Capricorn. The area so defined comprises Ceylon and India, Burma, Siam, Southern China and Indo-China, the Malay Peninsula, the whole East Indian Archipelago, Queensland, and many of the islands of the Pacific Ocean. Within this vast territory the ecological distribution of the wild species is mainly in forest areas, and although some of them are characteristic plants of secondary bush, others occur in relatively inaccessible places where opportunities for collection are few.

When found, the plants do not lend themselves to the preparation of useful herbarium specimens. The large inflorescences are usually not numerous, and it is only when material is abundant that the collector is fortunate enough to find all the stages necessary for a complete description. Even then, the size of the organs prevents the collection of more than fragments which, after laborious drying, present a sadly distorted caricature of the living plant.

Hence it comes about that the determination of species and varieties

depends largely on verbal descriptions and drawings of varying quality, and it is no matter for wonder that numerous errors have crept into the literature. More than in most genera, living material is the only satisfactory material for study, but few of the species are represented in botanical gardens, and those which can be obtained from botanical collections are, as often as not, wrongly named. The plants are not in general ornamental, their bulk makes them inconvenient to grow in any large numbers under glass in the temperate gardens, and it is only in the last few years that their importance has been recognized to justify the expense of forming and maintaining a collection in the Tropics.

The best collection of *Musa* in the world today is almost certainly that of the Imperial College of Tropical Agriculture in Trinidad, but that contains less than a score of distinct species ; and even of that small number, half a dozen are apparently undescribed, a fact illustrating very clearly the great amount of work remaining to be done before the genus can be considered well known.

Unfortunately, a paucity of material has not prevented the growth of a bulky and confusing literature. The edible bananas (in which term are included plantains) are important foodstuffs to large sections of the human race, and the plants attract the attention of the European traveller or sojourner in the tropics by reason of their unlikeness to anything in temperate floras. Consequently they have not been by any means neglected by botanists, but on the other hand accurate information about the genus as a whole has become confused and obscured by a disproportionate emphasis laid on the cultivated forms, and by erroneous accounts and opinions written by untrained or careless observers.

The seedlessness of the bananas has proved a cause of error to many, even among the botanists. Some have regarded the seedless forms as ranking with the fertile species and have bestowed Latin binomials upon them. Others have preferred to regard them all as varieties of one mythical "species" (usually called *Musa sapientum*) which is supposed to exist somewhere in a wild and fertile condition. Nearly all the older authors have been badly muddled about the efforts of "cultivation" in "improving" the wild forms and leading to the seedless condition. Such mistakes were natural enough before advances in genetics modified many of our views about the origins and taxonomic status of crop plants : they are not peculiar to the genus *Musa*, but they are unusually conspicuous in this group.

A modern view of the genetic system of banana varieties has been presented by K. S. Dodds (*Empire Journal of Experimental Agriculture* 11, 89-98 : 1943). Briefly, we now believe that "edibility" in the fruits of *Musa* spp. depends primarily on the occurrence of parthenocarpy, which is a genetic property preserved, but not induced, by domestication. With parthenocarpy there is always coupled a degree of female sterility and comparative seedlessness. In nearly all cultivated forms the sterility has become more absolute by the accumulation of structural changes in the chromosome mechanism during centuries of vegetative propagation. In many of them, though not in all, the reproductive mechanism is further complicated by polyploidy, the majority of the recognized horticultural varieties being triploids.

From the systematic point of view, the important finding is that as far as we can determine at present parthenocarpy has occurred in only three species of the whole genus *Musa*, and practically all the very numerous bananas and plantains described or mentioned in the literature descend from only two species. Some 30–40 Latin binomials applied by various authors to parthenocarpic forms can therefore be rejected as superfluous, and the cultivated members fall into true perspective as a side issue from a genus that probably contains some 40–50 valid, fertile, diploid species in the wild state.

The last good revision of the genus was made by J. G. Baker in 1893 (A synopsis of the genera and species of *Museae*. *Ann. Bot.* **7**: 189–222). It was made possible by the fact that there was in cultivation at Kew at the time an excellent collection of living material—the *Kew Bulletin* of 1894 lists no less than 25 different forms, including some banana varieties, with an asterisk denoting that examples were in cultivation—and stands in an entirely different class from some other accounts of the genus that have obviously been written entirely in the library. This has remained the standard treatment for more than fifty years, and its only general defect is that it is too concise for the importance of its subject, lacking explanatory notes so that the student is often left in doubt about the nature of evidence on which statements are made.

Since 1893, not only have about 50 new specific names been added to the genus, but genetical and cytological studies have thrown much light on relationships within it. A new revision is therefore overdue. But as modern researches have simplified the problem in some of its aspects, they have complicated it in others and revealed gaps in the available information such that any formal revision at the present moment would be likely to be out of date almost as soon as it was in print.

Materials for a revision have been collected over the last twenty years, and since they are still inadequate for their purpose it has seemed desirable to make them available to botanists who may be willing to assist in the task if provided with a statement of the present position and pointers to the various outstanding questions. As preliminaries I have recently proposed the transfer of some 25 species to the genus *Ensete* Horan. (p. 97), and the arrangement of those that remain in four sections of *Musa* instead of the two sections that were enough for the material known to Baker (p. 108). The most convenient way of presenting the remaining notes has seemed to be by taking the better known species one by one and bringing together for each as much information as there is available.

In nearly every case there is some new knowledge that has accrued from the observations of the banana research team at the Imperial College of Tropical Agriculture but has not hitherto been published. In some cases the observations serve to round off incomplete descriptions, in others they require a complete re-orientation of the older data. Personal opinions and interpretations are inevitably involved, and some care has been taken to indicate where they begin and end, in an endeavour to avoid further confusion of a literature already containing too much opinion and too little fact.

Because much of the difficulty in studying *Musa* arises from the scattering of the literature in relatively inaccessible publications, these

notes contain extensive transcriptions of important material from the older works. The aim has been to provide other workers on the genus with sufficient data for them to draw their own conclusions where they may be at variance with the compiler. There may be some overlap between the treatments of individual species : it has seemed desirable at this stage to make each article as complete as possible in itself.

For the photographs illustrating the notes I am indebted to Dr. K. S. Dodds, who has taken great pains to bring out the diagnostic features. The parts chosen for illustrations—fruit bunch and male bud—are those that in our own experience we have found most useful for recognition of species. A “banana-like” habit is so general that habit photographs as a rule show very little that cannot be conveyed equally well by words and figures, and they have therefore been omitted.

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The first of the Notes on individual species of *Musa* will appear in the next issue of the *Kew Bulletin*.

THE SYSTEMATIC POSITION OF THE GENUS *PYCNOBOTRYA*.

F. MARKGRAF.

The apocynaceous genus *Pycnobotrya* was established by Bentham in Bentham & Hooker, *Genera Plantarum*, 2, 715 (1876), and figured in Hooker's *Icon. Plant.* 12, 72, t. 1183 (1876). It is represented by one species in Gaboon (*P. nitida* Benth.); one other species, which Stapf described in the *Flora of Trop. Afr.* 4 (1), 203 (1902), from the Cameroons (*P. multiflora* Stapf), is scarcely distinct from the first one. The genus is not mentioned in the *Flora of West Tropical Africa* by Hutchinson and Dalziel and its position has not been reviewed since Stapf. Bentham had inserted *Pycnobotrya* among the *Echitoideae*, in which sub-family the anthers stick tightly to the stigma head and have an arrow-like appearance on account of their acute, not dehiscent tails. In this sub-family, however, there are ovaries with numerous ovules giving rise to comose seeds. Stapf, however, had appreciated that in *Pycnobotrya* there were only 4 ovules in each loculus, and that the 2 upper ones seemed to decay early. In the meantime Zenker distributed fruiting material from Bipinde, Cameroons (No. 3021a), as a result of the examination of which I am driven to the conclusion that the genus must be removed from the *Echitoideae*. These fruits resemble in the highest degree those of the American genus *Aspidosperma* Mart. & Zucc. The mericarp is 5 cm. long, 3.5 cm. broad, 1 cm. thick, dry, flat, elliptic with a curved excentric flank line that runs from the calyx to an inconspicuous tip (the remains of the style) : the outer side is opaque and dotted with a few small warts, the inner side is shining and very wrinkled. Clasping along the back edge it shows inside 2 oblong-elliptic seeds 4.5 cm. long, 3 cm. broad and scarcely 1 mm. thick. Each of them is surrounded by a papery wing about $\frac{1}{2}$ cm. broad and somewhat radially striped, and attached by a 2 cm. long funiculus, originating at their middle. The point of attachment of this is to be found at the transverse edge of each fruit valve, on the one at the upper edge, on the other of the same mericarp at the lower edge. Within the seed there lies as in *Aspidosperma* a flat embryo with huge (3×2 cm.), bluntly cordiform cotyledons and a short, blunt radicle (3 mm. long) embedded between very scanty remains of endosperm. Such a type of fruit is known in Africa as yet only in the genus *Diplorrhynchus* Welw., which is a near ally of *Aspidosperma*. By all these characters *Pycnobotrya* is kept quite apart from the *Echitoideae*. This view is strengthened by examination of the flowers. The oblong corolla lobes (agreeing with Bentham's description) open only to a funnel-shape as in *Aspidosperma* and *Diplorrhynchus* (Bentham's figure shows apparently a young bud that has been opened artificially). The anthers do not stick at all to the stigma head ; their tips are very acute, it is true, but their bases are bluntly cut and clasp to the very base. The stigma head is shortly cylindric and is crowned by two short, blunt, somewhat spreading lobes. All these characters agree quite well with *Diplorrhynchus*, likewise the short corolla tube ; only the style of *Pycnobotrya* is shorter. The fruit is broader, the seeds are not obliquely oblong, and the embryo is not situated excentrically.

I therefore consider that *Pycnobotrya* Benth. is better placed near *Diplorrhynchus* in the sub-family *Plumerioideae*.

A NEW GENUS OF CUCURBITACEAE.

D. CHATTERJEE.

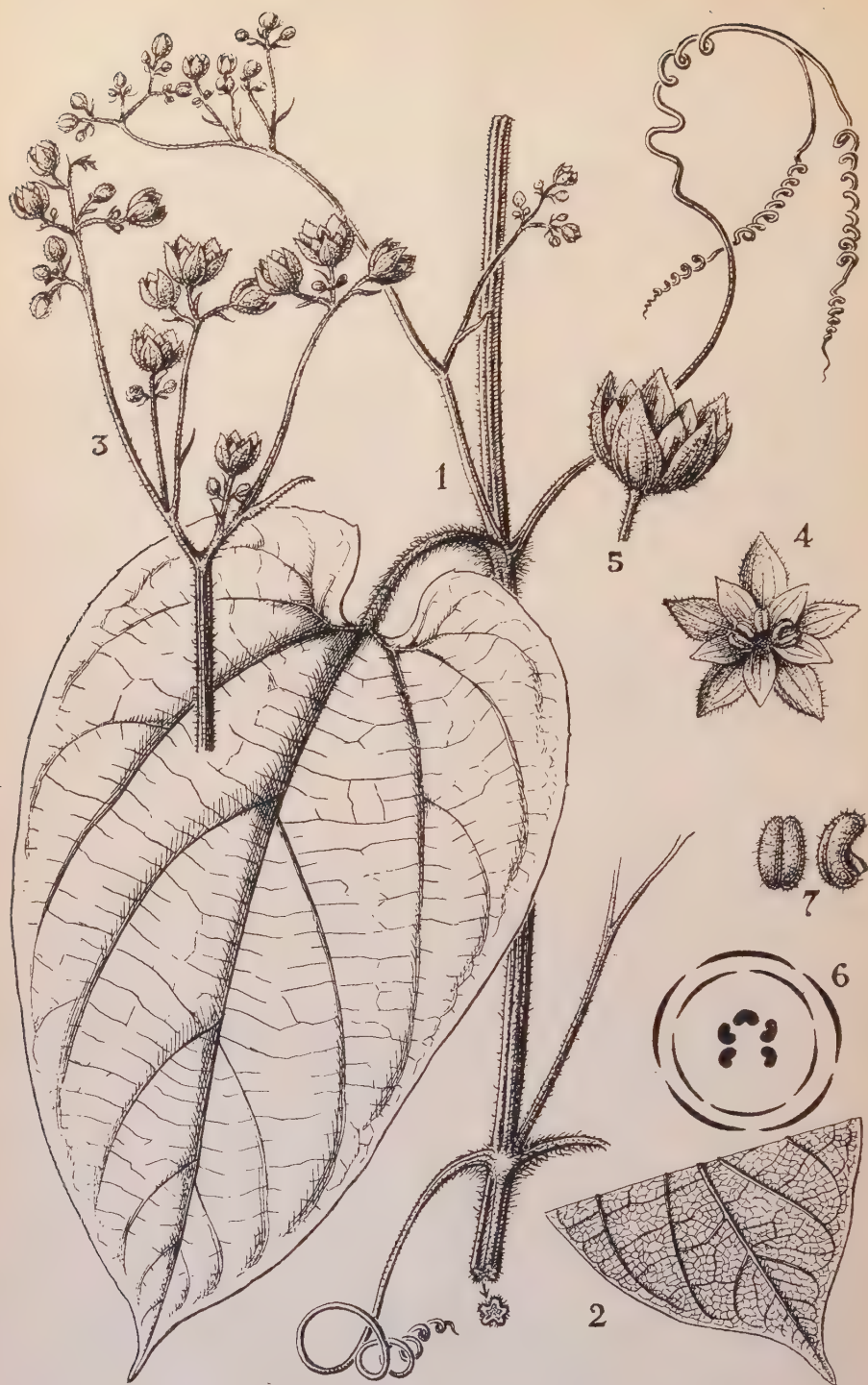
The family *Cucurbitaceae* is represented in India by 86 species and is widely distributed in various parts. There are only three genera which are localised and endemic in India, viz., *Biswarea* Cogn. and *Edgaria* C. B. Clarke of the Himalayas and *Dicaelospermum* C. B. Clarke of Bombay and Malabar. A fourth endemic genus is described in this paper, and this comes from the botanically rich area of Assam. The plant was first collected by Mann in 1883 in Khasia Hills and North Darrang, then by Burkill in 1911 in Abor Hills, and lastly by Dr. N. L. Bor in 1933 from the Aka Hills. The last three areas form a continuous chain of low-lying hills at the base of the Bhutan Mountains. Mann's collection was examined by Clarke at the Kew Herbarium as early as 1895. He wrote on one of the sheets "genus unknown; it is put in Kew as *genus ignotum*, but I think it *Zanonia* species." An examination of further materials was made along with that of Mann's sheets and it was soon found that the plant could not be *Zanonia* as suggested. This is due to the fact that the flowers have five free sepals and large flat, smooth, compressed seeds as against the three sepals and winged seeds of *Zanonia*. There are other differences as well, and the only apparent similarity is in respect of the broad, simple, coriaceous leaves of *Zanonia indica* Linn.

The new genus described below has some affinity with *Thladiantha* Bunge (as described under tribe *Fevilleae* in Cogniaux's monograph on Cucurbitaceae in the *Pflanzenreich*, 4, 275-1916). Similarities are evident in respect of the leaves specially with *Thladiantha calcarata* (Wall.) C. B. Clarke, dioecious flowers, five free stamens of which four are associated in two pairs, indehiscent fruit and seeds. But in respect of the larger free sepals, absence of basal scale, almost sessile stamens with reniform hairy anthers, and absence of pistillodes, as well as in the much larger fruit, the new genus differs distinctly from *Thladiantha*.

The five free lanceolate and acute sepals which are always larger than the five petals, and the short stamens with unilocular anthers, are very characteristic of this new genus. Unfortunately the female flowers have never been collected and so the distribution of the ovules within the ovary is not known. When this is known, the relationship of the new genus with *Thladiantha* and other genera of the tribe *Fevilleae* will be better understood. There is, however, no difficulty in placing the new genus under the above tribe in view of the five free stamens.

Indofevillea Chatterjee gen. nov., affinis *Thladianthae* Bunge, sed sepalis petala longe superantibus squamis floribus nullis, antheris subsessilibus, reniformibus, hirsutis, pistillodio nullo, fructuque multo majore satis discrepat.

Frutex scandens; folia petiolata, ovata, basi cordata, margine integra; cirri laterales, apice bifidi. *Flores* dioici, masculi tantum cogniti, omnibus partibus minute puberuli; pedunculi elongati, pedicelli brevissimi. *Sepala* acuta petalis acutis multo longiora. *Pistillodium* nullum. *Stamina* 5, libera; antherae reniformes, subsessiles, uniloculares. *Fructus* indehiscens; semina complanata ovata. Species unica Assamica.



Indofevillea khasiana Chatterjee

1, 2, $\times \frac{1}{2}$. 3, natural size. 4, 5, $\times 2\frac{1}{2}$. 7, $\times 7$.

Indofevillea khasiana Chatterjee sp. nov.

Extensive climber with five-ridged stem. Stem scabrid and sparsely villous with long multicellular hairs, stout and woody below with thick spongy bark. Leaves simple, petioled, alternate; lamina broadly ovate, cordate at the base, apex shortly acuminate, 21–27 cm. long, 13–17.5 cm. broad, margin usually entire, very rarely in some young leaves distantly and minutely toothed near the base, scabrid on the veins, otherwise glabrous on both surfaces; venation slightly raised on the upper surface, at least when dry, more distinctly so beneath; petiole stout, 1.5–8 cm. long, densely puberulous, and sparsely villous with rather stiff hairs. Tendrils, one with each leaf, about 20–30 cm. long, bifurcating in the apical third. Inflorescence axillary, about 17 cm. long, branched corymbose, peduncle and branches scabrid; bracts linear, acuminate, 5–9 mm. long, bracteoles 2–3 mm. long. Flowers unisexual, regular, pedicellate, pedicel scabrid. Male flowers :—sepals 5, free, equal, ovate, lanceolate with three or four nerves in each, always larger than the petals, 6 mm. long; petals 5, free, regular ovate-lanceolate, 3–5-nerved, sparsely and minutely hairy outside and papillose within, 4 mm. long; stamens 5, free, of which four stamens are associated in two pairs (but not united), subsessile, filaments very short, anthers reniform, unilocular, sparsely hairy; staminodes or pistillodes absent. Female flower not seen. Fruit (young) oblong, 10 cm. long, 3.5 cm. broad; (mature fruit) in clusters of 3–6 on a long stalk, 30 cm. long, fleshy indehiscent, with a thick woody rind. Seeds many, large, ovoid, compressed, faintly marginate, 3.5–4 cm. long, 2 cm. broad.

ASSAM. Khasia Hills, (?) G. Mann without number (two sheets); type in Herb. Calcutta.

Charduar Forest, Darrang district, G. Mann without number; three sheets in Herb. Kew.

Abor Hills, scrubby clearing near Rotung, alt. 530 m., 24 Dec., 1911, Burkill 37363; south of Libong stream, alt. 900 m., 8 Jan., 1912, Burkill 37742 (Herb. Calc., one sheet in Herb. Kew, see Rec. Bot. Surv. Ind. 10, 1925, p. 287).

Aka Hills, above Painjuli, 1000 m., 3rd week of April, 1933, N. L. Bor (two sheets in Forest Herbarium, Shillong, No. 633, and two sheets in Herb. Calc.).

REVIEW

Les Plantes Cultivées (Histoire-Économie).*—The name of this book implies that it deals with the history of economic plants, but in fact it covers a much wider field. The first chapter gives a general account of the origin of many important economic plants and of the manner in which they are presumed to have been dispersed to the various regions where they are now grown, from ancient times to the present day. Groups of plants are dealt with in more detail in the next eighteen chapters. The plants are classified according to their usage and include not only those of temperate regions, but also of the tropics and subtropics. Thus under cereals we find wheat, barley, rice, millets, all included together with some of the lesser known cereals. Other chapters deal with legumes and tubers, industrial plants which include fibres, dyes, tannins, insecticides, rubbers. Forage crops are grouped together and comprise natural and artificial pasture and fodder crops. There is a chapter on perfumery plants and on cover crops. There are others dealing with ornamental plants, shade and avenue trees and forest trees, poisonous weeds and so on. Finally, there are chapters devoted to an account of new methods of cultivating and improving plants with brief references to the effects of vernalization, the use of auxines and hormones, soilless culture and similar matters. Another section gives a brief account of the improvement of plants by selection, hybridization and variation. There is a great deal of interest in this book and the reader is intrigued in particular by references to plants which are rarely in the public notice and of which one would have liked to know more. Limitations of space have obviously prohibited the writer from giving more details of such plants, but having whetted the appetite it would have been useful if it had been found possible to give a list of references, so that the reader interested in a particular plant might have the opportunity of going deeper into the matter. Within these limits the book, which covers 349 pages, is a useful one for reference, but the subject is so vast that one cannot help feeling that it would have been better to split up the subject matter into two or three volumes each dealing with a separate section.

G. EVANS.

* By A. Guillaumin. Payot, Paris 1946, pp. 352, *frs.* 250.

AFRICAN ORCHIDS : XVII.

V. S. SUMMERHAYES.

The first eleven numbers of this series appeared in the Kew Bulletin (for No. XI see Kew Bull. 1939, pp. 489-500), but as during the war the Kew Bulletin stopped publication the next five numbers were published in the Botanical Museum Leaflets, Harvard University, as follows, XII, 10, 257-299 (1942) ; XIII, 11, 137-170 (1943) ; XIV, 11, 201-214 (1944) ; XV, 11, 249-260 (1945) ; XVI, 12, 89-116 (1945).

The present contribution contains descriptions of a number of new species, especially from the interesting and valuable collections made by Mr. & Mrs. R. E. Moreau in Tanganyika Territory, and by Dr. Paul Jaeger, of Dakar in French West Africa, in the Loma Mts. in northern Sierra Leone. The specimens collected by Dr. Jaeger were kindly sent to me for determination and contain numerous extensions of range of species into Sierra Leone as well as the new species. The type specimens of all the species described in this paper are in the Kew Herbarium.

Orchis maderensis *Summerhayes*, nom. nov. *Orchis foliosa* Solander ex Lowe (Prim. Flor. Mader.) in Trans. Cambr. Phil. Soc. 4, 13 (1831), non Swartz.

The trivial name *foliosa* cannot be used for this well-known Madeiran species owing to the earlier *Orchis foliosa* Swartz published in 1800. I have therefore suggested the trivial name *maderensis* which has the advantage of indicating the native country of the species.

Brachycorythis (§ **Eubrachycorythis**) **paucifolia** *Summerhayes*, sp. nov. ; affinis *B. angolensi* (Schltr.) Schltr. et *B. sceptro* Schltr., ab illa foliis majoribus, floribus fere duplo majoribus, labello distincte trilobato, ab hac foliis paucioribus latioribusque, bracteis flores non superantibus, floribus majoribus, petalis latioribus, labello angustiore trilobato satis distinguitur.

Herba terrestris saepius elata, 20-55 cm. alta, glaberrima. *Radices* numerosae, leviter flexuosae, carnosae, circiter 5 mm. diametro, laxae tomentosae. *Caulis* erectus, sublaxe paucifolius, basi 5-10 mm. diametro. *Folia* 8-12 ; 2-3 infima vaginiformia, obtusa ; 4-6 intermedia suberecta vel subpatentia, lanceolata, oblongo-lanceolata vel elliptico-lanceolata, apice obtusa vel acuta, apiculata, 5-17 cm. longa, 1.5-3.5 cm. lata, $\pm$ conduplicata ; 2-3 superiora minora, lanceolata, acuta vel acuminata, 3-5 cm. longa, bracteis similia. *Inflorescentia* simplex vel rarius ramo brevi instructa, dense multiflora, 5-11 cm. longa, 3.5-5 cm. diametro ; bracteae foliaceae, lanceolatae, acuminatae, inferiores flores aequantes, superiores sensim decrescentiae. *Flores* pro genere inter majores, suberecti, de colore nil constat ; pedicellus cum ovarium 1-2 cm. longus. *Sepalum* intermedium elliptico-lanceolatum, obtusum vel rotundatum, 10.5-14.5 mm. longum, 6-7 mm. latum, concavum ; sepala lateraliter oblique ovato-lanceolata, obtusa vel apiculata, 11-16.5 mm. longa, 4.75-7 mm. lata ; sepala omnia quinquennervia, nervis transversis numerosis, marginibus breviter involutis. *Petala* valde oblique lateque ovata, obtusa vel acuta, basi margine antica valde dilatata, margine postica cum columna breviter adnata, 10.25-14 mm. longa, 7.25-8.75 mm. lata, 5-6-nervia, nervis exterioribus multo ramosis. *Labellum* basi

saccatum vel breviter calcaratum ; lamina (epichilium) sessilis, lateribus reflexis, $\pm$ obovata vel orbiculari-obovata, antice $\pm$ truncata distincte trilobata, in toto 9–15 mm. longa, 7.25–10.5 mm. lata, carina mediana humili instructa ; lobus intermedius semi-orbicularis, ellipticus vel fere triangularis, rotundatus, 1.75–4 mm. longus, 2.25–4.75 mm. latus ; lobi laterales quam intermedius breviores, lati, rotundati ; calcar (hypochilium) semisphaeroideo-conicum, obtusissimum, 2–4.5 mm. longum. *Columna* basi cum labello adnata, brevis, crassiuscula, 4–5 mm. alta ; antherae loculi adscendentes, paralleli, contigui, canalibus subnullis ; pollinia clavato-obovoidea, caudiculis 1.5 mm. longis, viscidiiis fere orbicularibus 0.75 mm. diametro ; staminodia sessilia, orbiculari-oblonga ; rostellum lobus intermedius brevis, conduplicatus, lobi laterales breves, truncati ; stigma excavatum.

SIERRA LEONE. Loma Mts., in montane grassland, Aug. 1945, *Jaeger* 975 ; 1027 ; 1132 ; 1278 ; 1327 (type).

This very interesting species is evidently a common inhabitant of the grasslands occurring above the forest belt in the Loma Mountains.

B. paucifolia seems correctly placed in Schlechter's section *Eubrachycorythis* in view of the glabrous flowers and the general lip-structure. Within this group it appears to be most closely allied to *B. angolensis* (Schltr.) Schltr., both species possessing a comparatively small number of leaves, in which respect they differ from most other species of *Brachycorythis*.

The Sierra Leone species approaches more closely than does any other species the section *Basiphyllum* in which there are long radical leaves. In *B. paucifolia* the main leaves, however, although rather long, are borne in the centre of the stem, while in floral structure it differs in important respects from *B. basifoliata* Summerh. Nevertheless the present species may be looked upon as intermediate between the normal types of *Brachycorythis* and the section *Basiphyllum*.

Habenaria (§ **Multipartitae**) **jaegeri** *Summerhayes*, sp. nov. ; ex affinitate *H. mannii* Hook.f. et *H. splendidis* Rendle, ab utraque labelli lobis lateralibus subpalmatim pectinatis, stigmatum parte receptiva sessili, ab illa calcari duplo longiore, ab hac foliis anguste lanceolatis facile distinguenda.

Herba terrestris, erecta, circiter 70 cm. alta, sicco nigrescens ; tuber ellipsoideum, 3 cm. longum, fere 2 cm. diametro ; caulis validus, teres, 5–7 mm. diametro, basi cataphyllis 4 $\pm$ arcte vaginantibus apice acutis fere omnino obtectus, medio foliatus, in inflorescentiam terminans. *Folia* circiter 6, suberecta, e basi vaginante lineari-lanceolata vel lanceolata, acuminata, 10–20 cm. longa, 1.5–2 cm. lata, glabra, subtus prominenter trinervia. *Inflorescentia* 13 cm. longa, 7 cm. diametro, subdense circiter 12-flora ; bractae foliaceae, magnae, lanceolatae, acuminatae, flores fere aequantes, 3–4.5 cm. longae, circiter 1 cm. latae, subtus prominenter trinerviae. *Flores* magni, suberecti ; pedicellus cum ovario circiter 2 cm. longus. *Sepalum* intermedium lanceolato-ovatum, apice apiculatum, circiter 2 cm. longum et 1 cm. latum ; sepala lateralia valde oblique lanceolata, apice acuminata, basi subito angustata, circiter 2 cm. longa et 7.5 mm. lata ; sepala omnia quinque- vel sub-septem-

nervia, glabra, marginibus ciliolatis. *Petala* oblique curvatim vel geniculatim ligulato-lanceolata, apice obtusa, 1.75-2 cm. longa, circiter 4.5 mm. lata, tri- vel quadrinervia, glabra, marginibus ciliolatis. *Labelum* ex ungue circiter 5 mm. longo profunde tripartitum, in toto circiter 2.5 cm. longum et 2.75 cm. latum ; partitio intermedia recta, linearis, obtusa, 17 mm. longa, 2 mm. lata, convexa, inferne linea mediana incrassata instructa, puberula ; partitiones laterales inferne divergentes, superne arcuatim incurvatae, anguste flabellato-cuneatae, marginibus exterioribus basi excepta longe pectinatae, inferne puberulae, laciniis circiter 15 linearibus incurvatis 5-11 mm. longis glabris ; calcar sigmoidum, ex ore latiore anguste cylindricum, apice breviter inflatum, obtusum, circiter 3.75 cm. longum. *Antherae* connectivum taeniale, $\pm$ hippocrepiforme, circiter 7 mm. latum, dorso 3.5 mm. altum ; loculi reclinati, circiter 3 mm. longi ; canales non visi ; staminodia non visa. *Brachia* stigmatifera dimidio inferiore rostello adnata, dimidio superiore libera curvatim descendente ; pars libera omnino receptiva, 5 mm. longa ; rostelli lobus intermedius minutus, triangularis.

SIERRA LEONE. Loma Mountains, in high altitude grasslands, Aug. 1945, *Jaeger* 976 (type).

This species is the first representative of sect. *Multipartitae* to be found west of Northern Nigeria. In its narrow folded leaves it resembles *H. mannii* Hook. f. but possesses a much longer spur in which respect it agrees with the East African *H. splendens* Rendle. From both of these species it may be distinguished by the completely sessile receptive part of the stigmas and by the method of pectination of the lateral lobes of the lip. In the species mentioned, and also in the other large-flowered African species of the section, the slender processes arise more or less pinnately from a main portion which is of almost equal width throughout its length. In *H. jaegeri*, on the other hand, the main portion of the lateral lobe is cuneately or almost flabellately widened upwards and the processes arise from this widened part in an almost palmate manner.

Habenaria (§ *Diphyllae*) **trilobulata** Schltr. in Engl. Bot. Jahrb. **26**, 332 (1899). *H. quadrifila* Schltr. l.c. **53**, 504 (1915) ; Schltr. ex Mansf. in Fedde, Repert. Spec. Nov. Beih. **68**, t. 33, no. 129 (1932).

On examination of the type gatherings of the above two species I can discover no significant differences between them. In describing *H. quadrifila* Schlechter states that it is closely related to *H. trilobulata* from Mozambique but that the petals are "vollkommen verschieden". His descriptions of these members in the two species are, however, almost identical, this agreement being borne out by the specimens. As Schlechter refers to *H. mosambicensis* Schltr. in the course of his description of *H. quadrifila* it appears that he may have confused his two Mozambique species in his comments referred to above.

H. trilobulata is remarkable for the very unequal lobing of the petals, the filiform anterior lobe being three or four times as long as the rounded posterior lobe, and for the large rostellum which stands well in front of the much shorter anther.

Platycoryne ochrantha (Schltr.) Summerhayes, comb. nov. *Habenaria ochrantha* Schltr. in Engl. Bot. Jahrb. **53**, 494 (1915).

Liparis rufina (Ridley) Rchb. f. ex Rolfe in Dyer, Fl. Trop. Afr. **7**, 19 (1897). *L. nyassana* Schltr. in Engl. Bot. Jahrb. **53**, 560 (1915) ; Schltr. ex Mansf. in Fedde, Repert. Spec. Nov. Beih. **68**, t. 55, no. 218 (1932).

On the examination of the material of the type collection of *L. nyassana* (Stolz 1124) in the Kew Herbarium I fail to see any difference between this species and the widely spread *L. rufina* (Ridl.) Rchb. f. ex Rolfe. Schlechter figures the lip as rounded in front with no emargination and with a trilobed basal callus, but I do not find the former in the Kew specimen and I believe the latter to be a misinterpretation of the structure. In a long series of specimens of *L. rufina* the amount of emargination of the front lobe is seen to be quite variable, some lips being almost rounded in front. In all other floral features the specimens agree very well and evidently should be referred to one species.

The species is now known from Sierra Leone eastwards to Uganda and Tanganyika and then around the Congo Forest basin through Northern Rhodesia to Angola. The Nyasaland specimen suggested by Rolfe as belonging to his *L. ruwenzoriensis* appears to be referable to *L. rufina*.

Malaxis stolzii (Schlechter) Summerhayes, comb. nov. *Microstylis stolzii* Schltr. in Engl. Bot. Jahrb. **53**, 559 (1915).

The above species, which was previously only known from southern Tanganyika Territory, has now been discovered by Mr. E. Milne-Redhead in the extreme west of Northern Rhodesia. The two gatherings agree very well in all essential characters, but the Rhodesian specimens have slightly larger flowers.

Polystachya (§ Affines) **acridolens** Summerhayes, sp. nov. ; a *P. malilaensi* Schltr. sepalis brevioribus latioribusque, labelli ungue brevior ; a *P. zambesiaca* Rolfe sepalis angustioribus, petalis lineari-ligulatis, labelli disco fere glabro, ungue longiore ; ab utraque floribus acridolentibus satis distinguenda.

Herba epiphytica vel saxicola, parva. *Pseudobulbi* contigui, ovoidei, 1.5 cm. longi, circiter 1 cm. diametro, superne 2-3-foliati, inferne vaginis paucis membranaceis vestiti. *Folia* erecto-patentia, ligulata vel lineari-ligulata, apice rotundata, levissime inaequaliter bilobulata, 5-7 cm. longa, 7-9 mm. lata, viridia. *Inflorescentiae* erectae, simpliciter racemosae, 3.5-7 cm. altae, apice 3-8-florae ; pedunculus teres, 2-3 cm. longus, vagina lanceolata acuminata instructus, ut rhachis subdense pubescens ; bracteae late ovatae vel ovato-orbiculares, apice subito acuminatae. 4-6 mm. longae, 3 mm. latae. *Flores* erecto-patentes, acridolentes ; pedicellus (cum ovario) 6-7 mm. longus. *Sepalum* intermedium lanceolatum, acuminatum, convexum, 7 mm. longum, 2.5-2.75 mm. latum, trinervium ; sepala lateralia oblique triangularia, acuminata, margine posteriore 8-9 mm. longa, anteriore 7.5 mm. longa, 5-5.5 mm. lata, basi cum pede columnae adnata mentum subacutum 4.25 mm. longum formantia, quinquenervia ; sepala omnia extra sparse pubescentia. *Petala* lineari-ligulata, apice breviter acutata, 5.5-6 mm. longa, 1 mm. lata, uni- vel subbinervia ; tepala omnia laete viridia, basi purpureo-tincta. *Labellum* valde recurvatum, ex ungue brevi medio trilobatum, 7 mm. longum, 5 mm. latum ; lobi laterales erecti, fere sub-

orbiculares ; lobus intermedius lanceolato-ovatus, acuminatus, 3·5–4 mm. longus, 2·75 mm. latus, leviter ruguloso-bullatus ; discus callo semisphaerioideo ruguloso fere glabro instructus ; labellum album, lobis lateralibus purpureo-maculatis. *Columna* brevis, subteres.

TANGANYIKA TERRITORY. Njombe, Kifunga, near river, 1800 m. alt., coll. Mrs. H. W. D. Pollock ; flowered Amani, Jan. 1944, *Moreau* 492 (type) ; Njombe, Ruhiji River, 1800 m. alt., on rocks, coll. Mrs. H. W. D. Pollock ; flowered Amani, March 1944, *Moreau* 498.

A pretty little species with green and white flowers resembling *P. mali-laensis* Schltr. in the very narrow petals and *P. zambesiaca* Rolfe in the general features of the lip. The peculiar acrid smell of the flowers is a striking character from which the specific epithet is derived.

Polystachya (§ *Affines*) **acuminata** *Summerhayes*, sp. nov. ; a *P. mali-laensi* Schltr. foliis pro rata latoribus, floribus anisatis, sepalis lateralibus apice longe subulato-acuminatis, petalis $\pm$ lanceolatis acutis, labelli lobis lateralibus minoribus differt.

Herba epiphytica, humilis. *Pseudobulbi* ovoidei vel subsphaeroidei, 1–2·5 cm. longi, 5–10 mm. diametro, fusco-virides, nitidi, juventute inferne vaginis 2–3 obtusis $\pm$ scariosis instructi, superne 3–4-foliati. *Folia* patentia vel fere recurvata, oblanceolata, oblongo-vel elliptico-lanceolata, sub-acuta sed apice ipso breviter tridentata, infimum quam aliis saepius multo minus, 0·8–8 cm. longa, 5–13 mm. lata, viridia, purpureo-marginata et irregulariter purpureo-notata. *Inflorescentiae* simpliciter racemosae vel rarius pauciramosae, erectae, 6–14 cm. altae, dimidio superiore sublaxe 7–12-florae ; pedunculus 2–6 cm. longus, teres vel leviter compressus, vaginis paucis instructus, ut rhachis breviter pubescens ; bracteae late ovatae, acuminatae, 6–11 mm. longae, 5–7·5 mm. latae, sparse pubescentes. *Flores* $\pm$ secundi, adscendentes, anisati ; pedicellus (cum ovario) 5–7 mm. longus. *Sepalum* intermedium lanceolatum, acuminatum, convexum, incurvatum, 8·5–11·5 mm. longum, 1·75–3·25 mm. latum ; sepala lateralalia oblique vel subfalcatim triangularia, apice longe subulato-acuminata, 11–15 mm. longa, basi 4–5·5 mm. lata, cum pede columnae adnata mentum obtusum 3–4·5 mm. longum formantia, dorsaliter carinata ; sepala omnia trinervia, sparsiuscule pubescentia, lutescenti-olivaceo-brunnea. *Petala* curvatim lanceolata vel oblanceolata, acuta vel acuminata, 6–7·5 mm. longa, 1·25–2 mm. lata, subbinervia, olivaceo-ochracea. *Labellum* valde recurvatum, ex ungue brevi lato medio breviter trilobatum, 4·5–5 mm. longum, 3·5 mm. latum, pubescens ; lobi laterales erecti, rotundato-triangulares, 0·5–0·7 mm. longi ; lobus intermedius valde recurvatus, lanceolato-ovatus, acutus, leviter canaliculatus, 2·75–3·75 mm. longus, 1·5–2·75 mm. latus ; labellum album, lobi laterales intus intense purpurei, lobus intermedius subtus purpureo-marginatus. *Columna* brevis, lata ; anthera semi-sphaerica.

TANGANYIKA TERRITORY. Eastern Usambaras, Ngambo, 7 miles N. of Amani, 900 m. alt., in rain-forest, densely shaded, flowered February–March 1942, *Moreau* 130 ; Western Usambaras, in rain forest, shaded, March 1943, *Moreau* 130 A (type).

A typical member of sect. *Affines* especially characterised by the long-acuminate, almost caudate, solid apices of the lateral sepals, the acute petals and anise-scented flowers.

Polystachya zambesiaca Rolfe in Bull. Misc. Inform. Kew, 1895, 192. *P. hislopii* Rolfe, l.c. 1914, 375.

On examination of the two type specimens and of other gatherings I am of the opinion that these two are the same. *P. hislopii* was considered by Kraenzlin (Fedde, Repert. Spec. Nov. Beih. **39**, (1926) 86) to be a variety of his *P. lawrenceana*, but this species has stiffer leaves, differently coloured flowers and a much blunter and less curved middle lobe to the lip. For some quite unexplained reason he places *P. lawrenceana* in section *Grandiflorae* whereas *P. zambesiaca* is properly referred to section *Affines*. Both should be placed in the latter section.

Polystachya sectio **Isochiloideae** Summerhayes sect. nov.

Plantae epiphyticae vel saxicolae. *Rhizoma* breve repens vel paulo evolutum. *Caules* contigui, saepius erecti, basi in pseudobulbos saepius parvos incrassati, superne graciles et 2-5-phylli. *Folia* saepius $\pm$ erecta, linearia vel anguste ligulata. *Inflorescentiae* simpliciter racemosae vel e racemis brevibus paucis compositae, pluri- ad multiflorae; bractae parvae vel mediocres, rarius magnae. *Flores* pro genere satis magni, textura teneri, glabri vel pubescentes, labello saepissime pilis clavatis vel capitatis induto.

Species circiter 6 adhuc notae, Africae orientalis indigenae. Species typica sectionis—*P. isochiloides* Summerh.

In a previous contribution in this series (Bull. Misc. Inform. Kew, 1939, 498-9) I suggested that *P. isochiloides* Summerh., *P. shega* Kraenzl. and *P. goetzeana* Kraenzl., which I placed provisionally in sect. *Affines*, should probably form a new section. As a result of extensive collections in Tanganyika Territory by Mr. & Mrs. R. E. Moreau I have recently been enabled to examine a great deal of material belonging to the above or other closely allied species

As a result I am formally describing the new section *Isochiloideae* consisting of the three species mentioned above and three new species which are described in the following pages. There are also gatherings which may prove to belong to further undescribed species of the same affinity, but the material is not adequate for satisfactory description.

The new section evidently lies between sections *Affines* and *Dendrobianthe*, resembling the latter in the slender stems thickened at the base to form pseudobulbs and in the narrow grass-like leaves. The flowers are intermediate in texture between the two sections but the structure more closely resembles that of sect. *Affines*, the lip being distinctly trilobed with usually an acute middle lobe. The bracts are normally long and narrow but in *P. caudata* Summerh. they are very broad in the lower part and thus resemble those in sect. *Affines*. A striking feature, which occurs in all the species but *P. rugosilabia* Summerh., is the presence on the lip of numerous clavate or capitate hairs. Somewhat similar, but usually much shorter, hairs occur in sects. *Affines* and *Dendrobianthe*.

Polystachya (§ **Isochiloideae**) **caudata** Summerhayes, sp. nov.; a *P. isochiloides* Summerh. foliis paucioribus, bracteis late ovatis vel suborbicularibus apice caudatis, tepalis obtusioribus, labelli lobo intermedio late rotundato undulato, callo minus distincto differt.

Herba epiphytica ; caules approximati, erecti, basi pseudobulbosi, superne graciles, 3-4-foliati, 10-12 cm. alti., 1-2 mm. diametro ; pseudobulbi conico-ovoidei, 5-10 mm. longi, 4-7 mm. diametro. *Folia* suberecta, linearia, apice obtuse et inaequaliter bilobulata, vagina inclusa 13-22 cm. longa, 3-4.5 mm. lata, fusco-viridia. *Inflorescentia* $\pm$ erecta, racemosa vel e racemis paucis secundis composita, 7-24 cm. longa ; pedunculus 4-15 cm. longus, vaginis arctis scariosis acutis imbricantibus griseis omnino obtectus ; rami usque ad 4, 1.5-4.5 cm. longi ; rhachis teres, pubescens ; bractae patentes vel recurvatae, late ovatae vel suborbiculares, apice caudato-acuminatae, 5-11 mm. longae, inferne 5-6 mm. latae, glabrae vel sparsissime pubescentes. *Flores* erecto-patentes, albi vel cremei, labello rubro-notato, fragrantis ; pedicellus cum ovario 5-10 mm. longus. *Sepalum intermedium* lanceolatum vel oblongo-lanceolatum, apice subacutum vel apiculatum, 7.25-9 mm. longum, 2.5-3.25 mm. latum, convexum, subquinqnervium ; sepala lateralialia oblique lanceolato-triangularia, acuta vel apiculata, margine superiore (antico) 8.5-12 mm. longa, basi 4-6 mm. lata, cum pede columnae adnata, mentum rotundatum 3.5-5 mm. longum formantia ; sepala basi sparse pubescente excepta glabra. *Petala* oblanceolata vel subspathulato-oblanceolata, acuta vel subacuta, 6.5-7.75 mm. longa, 1.5-2 mm. lata, trinervia. *Labellum* valde recurvatum, ex ungue brevi medio trilobatum, 8-10.5 mm. longum, 6.25-7 mm. latum (explanatum) ; lobus intermedius recurvatus, quadrato-suborbicularis vel late semi-ellipticus, rotundatus, 3-3.75 mm. longus, 2.75-4 mm. latus, levissime undulatus ; lobi laterales erecti, triangulari-ovati, obtusi vel rotundati, margine antico 2.3-2.6 mm. longi ; discus callo longitudinali humili instructus, ut ungue et basibus loborum clavato- vel capitato-pilosus. *Columna* porrecta, semiteres, 2.75 mm. alta.

TANGANYIKA TERRITORY. West Usambara Mts., Bungeni, fl. Amani, Sept. 1942, *Moreau* 166 (type) ; East Usambara Mts., Monga Highforest, near Amani, 1000 m. alt., Nov. 1916, *Zimmermann* ; Gombora, 15 miles N. of Amani, Dec. 1941, *Moreau* 782.

This species, which is clearly a close relative of *P. isochiloides* Summerh., may be most easily distinguished from the other species of the section by the remarkable bracts which from a very broad base are suddenly narrowed to form a long tail-like apex. The branches of the inflorescence, as in *P. tessellata* Lindl. and other species, are all turned to one side of the main axis. The peduncle is covered with closely fitting scarious sheaths, while the bracts subtending the branch racemes are similar and partly cover the main rhachis. The clavate or subcapitate hairs, so characteristic of the section, cover thickly the lip callus and claw and occur less thickly on the bases and centres of the lobes.

Polystachya (§ **Isochiloideae**) **rugosilabia** *Summerhayes*, sp. nov. ; affinis *P. goetzeanae* Kraenzl., a qua floribus paulo minoribus, sepalis intermedio 3-5- nec 7-nervio, petalis apice acuminatis, labelli lobis lateralibus multo majoribus ab intermedio divergentibus, lobo intermedio basi angustato valde ruguloso medio 2-3-cristato cristis crenulatis satis distinguitur.

Herba epiphytica ; caules e rhizomate repenti exorientes, approximati, erecti, basi pseudobulbosi, superne 3-4-foliati, 5-6 cm. alti ; pseudobulbi ovoidei vel conico-ovoides, 5-7 mm. alti, 4-5 mm. diametro. *Folia* erecta, infimum ad vaginam truncatam redactum, superiora linearia, apice obtusa, breviter et inaequaliter bilobulata, 9-21 cm. longa (vagina inclusa), 3-5 mm. lata. *Inflorescentia* quam folia multo brevior, 5-7 cm. longa, superne pauciflora ; pedunculus 3-5 cm. longus, vaginis 2-3 spathaceis 2-4 cm. longis linearibus acutis imbricantibus suprema flores superante instructus ; rhachis leviter flexuosa, breviter pubescens ; bractae ovatae, subito et longe acuminatae, parvae, 1.5-2 mm. longae. *Flores* 1-2, $\pm$ patentes, glabri, fragrantis ; pedicellus cum ovario 5-7 mm. longus. *Sepalum* intermedium lanceolatum, leviter acuminatum, 9.5-11.5 mm. longum, 3.75-4.5 mm. latum, 3-5-nervium ; sepala lateralia oblique triangularia, acuminata, margine superiore (antico) 12.5-13.5 mm. longa, basi 7-9 mm. lata, cum pede columnae adnata mentum incurvatum rotundato-conicum apice bilobatum 6.5-7.5 mm. longum formantia, *Petala* e basi angusta lanceolata, acuminata, 10-10.5 mm. longa, circiter 3 mm. lata, trinervia ; sepala et petala alba, pallide purpureo-marginata. *Labellum* satis recurvatum, ex ungue breviusculo medio trilobatum, totum 12 mm. longum, explanatum 9.5-11 mm. latum ; lobus intermedius recurvatus, ex isthmo distincto suborbicularis vel fere transverse ellipticus, apice breviter acuminatus vel apiculatus, 6-7 mm. longus ; 5.5-8.5 mm. latus, marginibus leviter undulatis, valde rugulosus, medio 2-3-cristatus, cristis brevibus humilibus crenulatis ; lobi laterales erecti, ab intermedio fere angulo recto sejuncti, semiovati, apice rotundati, margine antico 4-5 mm. longi, praesertim antice rugulosi ; discus callo longitudinali pulvinari humili instructus ; labellum album, disco viridi. *Columna* 4 mm. alta, semi-teres, sensim angustata ; anthera hemisphaerica, antice truncata ; rostellum haud productum, leviter emarginatum, fovea stigmatica quadrata.

TANGANYIKA TERRITORY. Nguru Mountains, 750-900 m. alt., in dense shade, flowered Amani, Aug. 1942 and Sept. 1944, *Moreau* 343. "Leaves dark green. Flower mainly white with pinkish-mauve edges to sepals and petals ; disc of lip lime-green ; fragrant".

This attractive species is evidently allied to *P. goetzeana* Kraenzl. which it closely resembles in general appearance. It differs chiefly from this species, and indeed from the other species of the section, in the markedly rugulose lobes of the lip and the apparent absence from this organ of the clavate hairs so characteristic of the other species. In the small basal pseudobulbs, the long narrow leaves and the comparatively thin-textured flowers *P. rugosilabia* agrees with the remainder of the section.

Polystachya (§ **Isochiloideae**) **vaginata** *Summerhayes*, sp. nov., affinis *P. shega* Kraenzl., a qua pedunculo rhachidi longiore vel aequilongo ut rhachidi vaginis arctis fere omnino oblecto, florum colore satis distinguenda.

Herba epiphytica ; caules erecti, approximati, pseudobulbosi, anguste cylindrico-conici, 1-3 cm. alti, 5-10 mm. diametro, vaginis paucis acutis scariosis vestiti, superne 2-3-foliati. *Folia* suberecta, ligulato-linearia, apice rotundata, obtuse et aequaliter vel paulo inaequaliter bilobulata, 5-25 cm. longa, 3-8 mm. lata. *Inflorescentiae* saepius folios superantes,

simpliciter racemosae vel e racemis pluribus compositae, 7–48 cm. altae ; pedunculus 5–23 cm. longus, ut rhachis vaginis arctis ancipitibus acutis fere omnino obtectus ; rami usque ad 7, secundi, 1–4 cm. longi, 2–5-flori, rhachidi nuda densiuscule pubescente ; bracteae lanceolatae, acuminatae, 3–7 mm. longae. *Flores* erecto-patentes, suaveolentes ; pedicellus cum ovario 5–10 mm. longus, dense pubescens. *Sepalum* intermedium leviter incurvatum, lanceolatum vel oblongo-lanceolatum, acutum, 6·5–9·5 mm. longum, 2–4·25 mm. latum, tri- vel subquinquennervium ; sepala lateralibus oblique et anguste triangularia, acuminata, margine superiore 8·5–11·5 mm. longa, basi 5–5·5 mm. lata, cum pede columnae adnata, mentum incurvatum cylindrico-conicum rotundatum 3·5–4·5 mm. longum formantia ; sepala omnia extra sparsiuscule pubescentia. *Petala* oblique oblanceolata, acuta, 6–8·5 mm. longa, 1·5–2 mm. lata, trinervia. *Labellum* recurvatum, ex ungue cuneato dilatatum, medio vel supra medium trilobatum, 7·5–9·25 mm. longum, explanatum 5·25–6 mm. latum ; lobus intermedius recurvatus, ovatus vel late ovatus, acuminato-apiculatus, 2·5–4 mm. longus, 3–3·25 mm. latus, marginibus undulatis, medio $\pm$ dense clavato-pilosus ; lobi laterales erecti, rotundato-triangulari, margine antico 1–1·5 mm. longo, antice clavato-pilosi ; discus callo parvo humili instructus. *Columna* porrecta, semiteres, 2·5 mm. alta ; anthera hemisphaerica, antice haud producta ; fovea stigmatica suborbicularis.

TANGANYIKA TERRITORY. Ufiome Mt., S. of Lake Manyara, south side, 1800 m. alt., at forest edge, coll. R. E. Moreau, fl. Amani, Aug. 1943, *Moreau* 314 (type), "Sepals light brown, petals and labellum yellow"; Tarosero-Burko ridge, 40 miles W. of Mt. Meru, north side, 1500 m. alt., Feb. 1943, coll. H. F. I. Elliott, fl. Amani, *Moreau* 455, "Flower very pale green with white labellum"; Lolai-kamaishi Hill, 28 miles S. of Ngasumet (i.e. 100 miles S. of Moshi), 1140 m. alt., on single tree in thorn scrub, coll. Page-Jones, fl. Amani, Aug. 1943, *Moreau* 561, "Sepals lime-green with back midrib and apex maroon. Petals green. Labellum yellowish-white".

This species is evidently very closely allied to *P. shega* Kraenzl. It has, however, a relatively larger inflorescence with the peduncle and rhachis covered with closely imbricating greyish sheaths, the leaves are a little broader and usually only 2 in number, while there are no red markings on the lip. It appears to be widely distributed in central Tanganyika Territory.

Polystachya (§ Dendrobianthe) bequaertii *Summerhayes*, sp. nov. ; a *P. tayloriana* Rendle inflorescentiae ramis multo longioribus, floribus laxioribus, labello basi magis angustato fere breviter unguiculato superne obscure trilobato pilis longioribus instructo satis distinguenda.

Herba terrestris vel rupicola ; caules approximati, erecti, basi pseudobulbosi, superne graciles, sub anthesi fere vel omnino aphylli, 15–50 cm. alti, 1–2 mm. diametro, vaginis 6–9 arctissimis breviter imbricatis omnino obtecti ; pseudobulbi conico-ovoidei, 1–2 cm. longi, 0·5–1 cm. diametro. *Folium* (solum vidi) lineare, conduplicatum, circiter 8 cm. longum, 4 mm. latum. *Inflorescentia* terminalis, simplex vel e racemis usque ad 4 $\pm$ secundis composita ; rami singuli vel gemini, ex axi arcuatim divergentes, graciles, usque ad 7 cm. longi, per totam longitudinem floriferi, usque

ad 20-flori; rhachis leviter fractiflexa, teres vel obtuse angulata, fere glabra; bracteae 2-4 mm. distantes, erecto-patentes vel fere patentes, late triangulares, acuminatae, 1-2.5 mm. longae. Flores suberecti, purpureo-rubri (fide collect.); pedicellus cum ovario gracillimus, 1-2 cm. longus, omnino glaber. *Sepalum intermedium* oblongo-lanceolatum, apice rotundatum leviter emarginatum, convexum, tri- vel subquinquenervium, 6-8 mm. longum, 2.75-3.5 mm. latum; sepala lateralia oblique et leviter curvatim triangularia, apice subacuta, margine superiore (antico) 7.5-9 mm. longa, basi 6-6.5 mm. lata, quinquenervia, cum pede columnae adnata, mentum rotundatum arcuatum 5.5-6 mm. longum formantia. *Petala* elliptico- vel subspathulato-ligulata, apice rotundata, basi angustata, 6-7.5 mm. longa, trinervia; tepala omnia textura tenuiora, glaberrima. *Labellum* valde recurvatum, ex ungue brevi dilatatum, supra medium obscure trilobatum, totum 6.75-8 mm. longum, medio 3.5-4 mm. latum (explanatum); lobus intermedius quadrato-suborbicularis, apice recurvatus apiculatus; lobi laterales erecti, late rotundati, ex intermedio sinu indistincto sejuncti; discus callo longitudinali humili densissime clavato-piloso instructus; lobi marginibus exceptis pilis longioribus apice clavatis modice obtecti. *Columna* porrecta, semiteres, superne subalata, 3.5-4 mm. alta; androclinium leviter excavatum; anthera hemisphaerica, leviter cristata; pollinia quadrato-sphaeroidea, 0.5 mm. diametro, stipite brevi lato, viscidio lunato; rostellum vix productum; fovea stigmatica transverse oblonga.

SIERRA LEONE. Loma Mts., high altitude grasslands, terrestrial in moss carpet, Nov. 1944, *Jaeger* 660.

LIBERIA. Mt. Mpaka Fossa, near Kolahun, at summit, 588 m. alt., growing on bare rocks, flowers purple-red, Jan. 1944, *Bequaert* 40 (type); Ballawallah, between Kailahun and Bolahun, on rocks, Feb. 1944, *Bequaert* 70.

The species is especially interesting because it shows the close affinity between the two sections *Dendrobianthe* and *Isochiloideae*. In its precocious habit and glabrous delicate flowers *P. bequaertii* agrees with the former section but the lip is obscurely trilobed just above the middle and is definitely narrowed at the base forming an indistinct claw, in both respects approaching sect. *Isochiloideae*. The laxer inflorescence branches separate it at once from all other species of *Dendrobianthe* and in this character also the affinity with the other section is indicated.

The occurrence of a species of either section in West Africa is of considerable interest as they are both only known from the eastern and southern tropical parts of the continent. This discovery is yet another indication of our ignorance of the African flora.

Eulophia livingstoniana (*Rchb. f.*) *Summerhayes*, comb. nov. *Lissochilus livingstonianus* Rchb. f. *Otia Bot. Hamburg.* 114 (1881).

The epithet *livingstonianus* is the earliest of those proposed for species of this group of *Eulophias* and it therefore seems advisable to make the combination for practical purposes. It is probable that several of the other allied species will prove to be conspecific with the above.

Eulophia pyrophila (*Rchb. f.*) *Summerhayes*, comb. nov. *Lissochilus pyrophilus* Rchb. f. *Otia Bot. Hamburg.* 65 (1878).

Eulophia caloptera (Rchb. f.) Summerhayes, comb. nov. *Lissochilus calopterus* Rchb. f. in Bonplandia, **3**, 218 (1855).

This species may be distinguished from its nearest relatives by the narrow rolled-up leaves which have a rush-like appearance. It has so far only been recorded from the coastal regions of Mozambique and Tanganyika Territory. Several of the specimens cited under this species by Rolfe in the Flora of Tropical Africa (Vol. 7, pp. 93-94) belong to other species.

Angraecum humblotii (Finet) Summerhayes, comb. nov. *Macroplectrum humblotii* Finet in Mém. Soc. Bot. France, **9**, 22, t. IV, fig. 1-9 (1907). *Angraecum humblotianum* Schltr. in Beih. Bot. Centralbl. **33**, ii, 434 (1915). *A. finetianum* Schltr. l.c. **36**, ii, 158 (1918). *A. abietinum* Schltr. in Fedde, Repert. Spec. Nov. Beih. **33**, 313 (1925).

When Schlechter transferred Finet's *Macroplectrum humblotii* to the genus *Angraecum* he proposed a new epithet *humblotianum* in view of the existence of *Angraecum humblotii* Rchb. f.

Examination of the place of publication of this latter name shows, however, that it is mentioned in notes following the description of *Aëranthus leonii* Rchb. f. merely as a synonym of this. Reichenbach explains that the name had been given to Humblot provisionally for a plant which was exhibited at the Paris Exhibition of May 1885. Reports in contemporaneous French periodicals (Rev. Hort. **57**, 282 : 1885 ; Journ. Hort. France, sér. iii. **7**, 190 : 1885) of the plants shown at the Exhibition do not mention the name *Angraecum humblotii* but instead *A. leonii*, the alteration no doubt having been conveyed by Reichenbach to Humblot while the exhibition was in progress. The name *Angraecum humblotii* Rchb. f. is therefore merely proposed in synonymy and is not validly published. Consequently there was no need for Schlechter to provide an alternative epithet for Finet's species and the epithet *humblotii* is the correct one for this species.

I am therefore making the correct combination in the genus *Angraecum* for Finet's plant (*Humblot* 670) and am citing all the other synonyms of which I am aware.

Diaphananthe bidens (Swartz) Schlechter, Die Orchideen, 593 (1914). *D. trigonopetala* Schltr. in Orchis, **8**, 136, t. 4, fig. 25-32 (1914).

By an oversight I omitted *D. trigonopetala* from my treatment of the genus in a recent number of this series (Bot. Mus. Leaflet Harv. Univ. **12**, 95-111 : 1945), neither does the species appear in Schlechter's revision of the genus (Beih. Bot. Centralbl. **36**, abt. 2, 95-101 : 1918).

An examination of the excellent illustrations and of Schlechter's description shows without doubt that his species is merely another variant of the widely spread *D. bidens*. All the differential characters he mentions can be found in specimens of *D. bidens* either singly or combined in different manners so as to produce all possible gradations.

REVIEW.

Plant life of the Pacific World.*—The attack by Japan, in December 1941, on United States, British, and Dutch territories in the northern Pacific naturally increased the demand for information regarding Pacific lands and especially those exposed to the direct shocks of war. The American and Australasian governments published a number of pocket-books primarily for the use of members of their forces engaged in the Pacific area and dealing entirely or in part with plant-life. Prof. E. D. Merrill is responsible for "The Plant Life of the Pacific World" issued in 1945 as a part of The Infantry Journal and also published, as one of The Pacific World Series, under the auspices of The American Committee for International Wild Life Protection. In the editorial Foreword the work is termed an "unusual book," and unfortunately the phrase is justified, for biology would be much better served than it is were books of this model very usual. It is not a text book of botany, or of any particular branch of botany, but naturally pays special attention to the ecological and economic aspects. One may perhaps criticize the title relative to the contents, since the book is almost entirely concerned with the northern, and especially the north-western, Pacific, indeed, very largely with the Malay Archipelago in the broadest sense. The only index mention of New Zealand, for example, is to a single bibliographical reference, and Australia is similarly only quoted in bibliography.

The variety of topics considered must include some which would arouse the interest of any layman of average ability and education. Plants of the seashore, the mangrove forest, secondary forests and open grasslands, the primary forest, and jungle foods, are some of the chapter headings. The professional botanist, knowing Prof. Merrill's vast knowledge and wide experience of Pacific botany, will turn with interest to the two chapters dealing with plant distribution in Malaysia and Polynesia respectively. He will also value the adequate bibliography.

The book is illustrated by more than 250 black-and-white drawings, mostly of plant species important because of their ecological occurrences or economic values.

W. B. TURRILL.

* By E. D. Merrill : The Macmillan Company, New York, second printing 1946, 16/-.

PLATE 5



Senecio meruensis (Greenway 7802) at 10,300 ft. on Mt. Meru.

Photo—P. J. Greenway.

**AN ARBORESCENT *SENECIO*
FROM MT. MERU : *S. MERUENSIS* SP. NOV.**

A. D. COTTON AND R. A. BLAKELOCK.

The existence of arborescent *Senecios* on various smaller summits in British East Africa was discussed in a paper in the *Kew Bulletin* in 1937 (1). Since then adequate material has been received of the single species known to occur on one of the mountains—Mt. Meru, which is an isolated volcanic summit, 14,902 ft. in altitude, about 40 miles west of Kilimanjaro.

Though this species has never been described, its presence on Mt. Meru has been known for over forty years. Mildbraed cites a specimen collected by Uhlig as follows : “Südseite, auf grasigen Stellen, in der Ericaregion, ca. 3400 m. ü. M. Waldform, wenig behaart. (Altes Blatt, November 1901—Uhlig No. 685)” ; he refers it to *S. kilimanjari* Mildbr.(2).

It was next collected by the late B. D. Burtt, who in 1932 ascended the west side of the mountain and sent two herbarium specimens and a short length of trunk to Kew. Mr. H. F. J. Elliot, an administrative officer, collected a specimen in 1943.

Recently further material, including herbarium material of the flowers, leaves, a young plant, pickled material of the flowers, and wood specimens, as well as photographs, has been provided by Mr. P. J. Greenway, of the Agricultural Research Institute, Amani.

From the field notes of the last three collectors the following account of the distribution and ecology of the plant, which is described below as *S. meruensis* sp. nov., can be given.

The species occurs between 9,500 and 11,500 ft. on the south, south-east and west aspects of the mountain. On the west side of the cone it grows very locally in deep saturated ravines with precipitous sides, amongst *Philippia* heavily laden with moss, with *Erica arborea* on barer patches and *Alchemilla* as the dominant herb (9,500–10,500 ft., Burtt 4050). On the north wall and lava flow in the great crater, *S. meruensis* is found on moss and humus collecting on the new lava flow, among *Philippia* and *Erica arborea*, also on precipitous cliffs on mossy ledges. Here the trees are locally scattered, not dominating the vegetation as in the Virunga Mts. (10,500–11,500 ft., Burtt 4051).

Mr. Greenway reports, however, that the species may be locally dominant in seepage zones with *Hagenia*, *Ericaceae*, *Pygeum*, *Conyza*, *Hypericum lanceolatum* and *Helichrysum fruticosum* at 10,300 ft. on the south slope of the mountain (see plate).

Mr. Elliot's specimen was collected in stunted tree-heath, at about 10,000 ft., on the S.E. ridge.

The description is as follows :—

S. meruensis Cotton et Blakelock, sp. nov. : a *S. kilimanjari* Mildbr. foliis oblongo-ellipticis, tenuioribus, infra minus dense crispato-pilosis, disci floribus paucioribus differt.

Arbor usque 8 m. alta. *Truncus* simplex vel ramosus, apice foliis marcescentibus vestitus. *Folia* tenuia vel subcrassa, oblongo-elliptica, dentata, dentibus usque 3 mm. longis ; lamina apice obtusa vel subrotundata, basi subrotundata vel in foliis minoribus in petiolum

sensim attenuata, 10.5–65 cm. longa, 5.2–26 cm. lata, supra glabrescens vel sparse pilosa, infra sparse vel modice dense crispato-pilosa, margine $\pm$ elevata et tomentosa, costa praecipue basin versus pilosa demum glabrescente, nervis lateralibus angulo acuto vel obtuso ortis 1–4.5 cm. inter se distantibus; petiolus alatus, 6–20 cm. longus, angustissima parte c. 1–4 cm. latus, basi latior, infra costa longe pilosa, supra basin dense longeque pilosus. (In plantis juvenilibus folia oblongo-elliptica, obtusa, usque 24 cm. longa, 11.5 cm. lata, infra sparse crispato-pilosa, costa pilosa; petiolus haud alatus, pilosus, usque 18 cm. longus, 5 mm. latus.) *Inflorescentia* c. 1 m. longa; axis ramulique lanati; bracteae foliosae, supra glabrescentes vel sparse pilosae, infra sparse vel modice dense crispato-pilosae, basi late alatae. *Capitula* subcampanulata, 1–1.5 cm. longa, c. 1 cm. lata (ligulis excl.). *Involucri bracteae* lanatae vel glabrescentes, 3-seriatae; exteriores 1-seriatae, 7–14, lineares, 5–11 mm. longae, 1 mm. latae; interiores 2-seriatae, 12–14, oblongo-lanceolatae, acutae, 10–13 mm. longae, 2–6 mm. latae. *Flores radii* 7 (?)—17, longe ligulati, pallide flavi; ligula 15–20 mm. longa, 2–3.5 mm. lata, tubo 5–7.5 mm. longo. *Flores disci* 44–65, corolla 8–10 mm. longa. *Ovaria* glabra, striata.

TANGANYIKA. Mt. Meru, 9,500–10,500 ft., west side of cone, 28.9.1932, B. D. Burt 4050 (type), 4004; 10,500–11,500 ft. or more, on north wall and lava flow in the great crater, 5.10.1932, Burt 4051; c. 10,000 ft., S.E. ridge, 1943, H. F. J. Elliot 9770 (Herb. Amani); 10,300 ft., S. slope, 23.6.1946, P. J. Greenway 7801, 7802.

S. meruensis, as might be expected, is most closely related to the Kilimanjaro series of species. It differs from *S. johnstoni* in the lack of the cordate leaf-base and in the larger capitula, and from *S. kilimanjari* in its more slender habit, which is correlated no doubt with the fact that it grows with tall shrubs, whereas *S. kilimanjari* occurs in the open. Thus we find that *S. meruensis* may attain a height of 8 m. against the 5 m. of *S. kilimanjari*; its leaves moreover are thinner and less hairy, there is less marcescent foliage and the capitula are smaller. In many respects, therefore, it is intermediate between *S. johnstoni* and *S. kilimanjari*.

As to species on other mountains, *S. meruensis* is distinguished from all the Cherangani and Mt. Elgon species (with which it might be expected to have affinity) by the raised tomentose margin on the underside of the leaf.

The field notes add some further details. The trunk is bare below, and with up to 20 dead leaves remaining under the living ones, often with the old panicle persisting among the dead leaves. The trees are branched up to eight times, although unbranched flowering specimens were often seen. One old tree was observed bearing 20–30 flower heads. The leaves are described as bright green, the involucre bracts as tinged with red, and the flowers as lemon yellow. Flowers have been collected in June and September.

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COLPOMENIA SINUOSA.

C. I. DICKINSON.

Soren Lund has recently published a very clear account of an alga which appeared in the English Channel at the beginning of the century and passed under the name of *Colpomenia sinuosa* (Roth) Derb. et Sol.

Briefly, the facts are that *C. sinuosa*, common in the Mediterranean, was known only as far north as Cadiz until 1905, when attention was drawn to what was thought to be the same species causing destruction in the oyster beds at Vannes in Brittany. It spread rapidly in both directions along the coast of France and also along the English side of the Channel. Since then it has been extending northwards and is now reported by Lund in Denmark.

Sauvageau (1927) pointed out that the western European alga differed from the Mediterranean one, but that it resembled a *Colpomenia* found on the Pacific Coast of North America as far north as Alaska. He treated it as var. *peregrina* of *C. sinuosa*, but suggested that it might even merit specific rank.

Lund has drawn up a description which he says is based principally on Sauvageau's work, and he makes a species of var. *peregrina* in the title of his paper, although nothing is said about this in the text. Lund draws attention to some discrepancy in descriptions of the plurilocular sporangia of the cold water form. According to his own observations most of the sporangia had 4 or 5 tiers of cells while Cotton (1908) figured sporangia with 7 tiers. Lund has, however, omitted mention of one paper which may have some bearing on the problem.

Kunieda and Suto (1938), in giving an account of the life-history of *Colpomenia* found in the neighbourhood of Misaki, describe three types of sporangia; dioecious plants of the spring producing what they suppose to be male and female gametangia, and autumn plants producing sporangia which liberate zoospores. All three reproductive bodies were different and what were supposedly the female gametangia had 4 tiers.

Some very fine specimens of *Colpomenia* washed up near Portland in May, 1946, were collected by H. K. Airy-Shaw. They appeared to be the typical Channel form, having a thin and more or less globose thallus. One measured about 25 cms. at its greatest width, which is a good deal larger than specimens usually found on the English coast. Unfortunately the specimens were put into rather strong formalin and when examined were not in very good condition, but they did show sporangia mostly with 4 or 5 series of cells. This led to an examination of herbarium material, which showed that a plant collected in September, 1907, at Torquay corresponds to that figured by Cotton, while a specimen collected at Weymouth in April, 1908, has sporangia of the 4 series type. There is very little fertile material in the Kew herbarium, but the result of examining these few specimens suggests that it might be worth while making careful comparison with fresh specimens found at different times of the year with a view to establishing whether or not in this country the plants are of two different kinds.

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REVIEW

Vegetable Cultivation in Hong Kong*.—This book is in many ways a remarkable production. It was largely written "during a sojourn of 43 months in the Civilian Internment Camp at Stanley," as a second edition of a work that "was prepared in a hurry during the hot summer of 1941." Possibly the "ample time" referred to in the Introduction accounts for some of the undoubted merits of both the text and the drawings.

The first seventy pages deal with matters of general horticultural interest, which are for the most part treated in an up-to-date and very readable manner. The rest of the book gives details regarding the garden crops grown in Hong Kong, under the main headings: salads, spinaches, cabbages, onions and other greens, beans and peas, gourds and cucumbers, fruits and seeds, roots and tubers, and market vegetables. In addition to vegetables well-known in Britain a number are described which might be tried here in the warmer parts of the country. The information given under the species is often unusual and is therefore the more valuable. One concludes that the writer "knows his plants" at first-hand.

W. B. TURRILL.

* By G. A. C. Herklots. Printed by The South China Morning Post, Ltd., Hong Kong, April 1947, price \$12.00.

REVIEW.

The genus *Paeonia.**—Perhaps no better proof of the close and happy relationships existing between botany and horticulture can be found than this volume of Col. Stern's study of the paeonies. On any standard it is a first class production: in the present times of austerity it can only be described as sumptuous. Miss Snelling's beautiful coloured illustrations and the excellent fount naturally attract immediate attention. The only complaint that can be made regarding production is that some of the paintings might with advantage have been so centred as to leave a somewhat wider margin at the top.

Col. Stern recognizes 33 species and 14 varieties, which are divided into three sections, two of which have two subsections each. There is a key to the sections and subsections and another to the species and varieties. References, synonyms, a description, the known distribution, and (usually) a discussion are given for every one of the species and varieties. Text figures of leaves or carpels are sometimes provided. There is a chapter, chronologically arranged, summarizing the history of paeony literature, and another on paeony species in cultivation. An appendix lists the species and synonyms and a second gives the bibliography. There is a very short index.

The practical taxonomic value of this monographic study is bound to be very great, the more so that the treatment of species appears well-balanced, with neither over-splitting nor over-lumping. It is interesting to note how the taxonomic treatment as based on gross morphological and chromosome characters is reflected in the geographical ranges of both sections and species. The genus is limited to the Northern Hemisphere. The section *Moutan*, consisting of species with woody stems, is limited to eastern Asia; the section *Onaepia* contains herbaceous species confined to western North America; the section *Paeon* is composed of herbaceous species found in Europe, North Africa and Asia, from Spain to Japan. The two North American species (*P. brownii* and *P. californica*) of the section *Onaepia* and the shrubby species ("tree paeonies") of the section *Moutan* are all diploid ($2n = 10$). With the exception of one, all the species of *Paeonia* in central and eastern Asia of the groups *Lactiflora*, *Mairei*, *Obovata*, and *Anomala* are diploids. In six groups, one of the species is a diploid and the remainder of the species in the group are tetraploids. The diploid and tetraploid species in every group are closely related morphologically and are found in associated geographical areas. In general, the tetraploids are larger and stronger growing plants than the closely related diploid and have much more extensive ranges: It is postulated that diploid species were pushed south in Europe with the oncoming of the Ice Age. They gave rise to tetraploid species which proved better adapted to the post-glacial conditions and spread farther afield than the diploids owing to their greater vigour.

Col. Stern and the Royal Horticultural Society are to be congratulated on this excellent "Study," which is dedicated to the author's wife.

W. B. TURRILL.

* A Study of the Genus *Paeonia*, by F. C. Stern, O.B.E., M.C., F.I.S., V.M.H. London: The Royal Horticultural Society, Vincent Square, S.W.1., 1946. Price 3 guineas.

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